DOCUMENT RESUME

ED 021 786 24 SP 001 518

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PSYCHOPHYSIOLOGICAL CORRELATES OF FEMALE TEACHER BEHAVIOR AND EMOTIONAL STABILITY: A SEVEN-YEAR LONGITUDINAL INVESTIGATION

California Univ., Los Angeles. Center for the Study of Evaluation of Instructional Programs.
Spons Agency- Office of Education (DHEW), Washington, D.C. Bureau of Research.
Report No- CSEIP-TR-3
Bureau No- BR-6-1646
Pub Date Nov 67
Contract- OEC-4-6-061646-1909
Note- 168p.
EDRS Price MF-$0.75 HC-$6.80
Descriptors- CORRELATION, *EMOTIONAL ADJUSTMENT, FEMALES, INDIVIDUAL DIFFERENCES, INSERVICE TEACHING, LONGITUDINAL STUDIES, *PSYCHOLOGICAL STUDIES, *PSYCHOPHYSIOLOGY, RATING SCALES, STUDENT TEACHERS, *TEACHER BEHAVIOR, *TEACHER EVALUATION, TEACHER SELECTION

This study investigated the relations of personality and the autonomic nervous system (ANS) to ratings of teacher behavior, emotional stability, and general health as measured during student teaching and the 1st, 6th, and 7th years of in-service teaching for 279 female subjects. The theses tested were that (1) measures of individual differences in ANS functions afford a means of predicting those teachers who will be least likely to withstand the stresses of teaching and (2) these measures in conjunction with indexes of personality, mental and physical health, and controlled appraisals of teaching performance will provide improved predictive indexes of teacher behavior. Results verifying relationships between ANS and personality were consistent with those of previous studies of children and males. Among other conclusions were that (1) teachers who show autonomic balance in the direction of relative parasympathetic nervous system dominance adjusted least well to teaching and (2) characterization of the less successful teachers as less friendly and sociable, less objective, less emotionally stable, more introverted and more tense, was consistent with differences in ANS functioning. Included are 49 statistical tables recording the psychophysiological test battery results; a list of 33 references; and 20 pages of data recording forms, rating scales, and inventories. (JS)

Technical Report No. 3

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Center FOR THE Study of Evaluation OF INSTRUCTIONAL PROGRAMS

University of California, Los Angeles, December 1967

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I. Normative Data on Autonomic Nervous System Functions, and Psychophysiological Correlates of Student Teaching Performance

II. Re-analysis of the Physiological Test Data

III. Psychophysiological Correlates of Teaching Performance During the First In-service Year

IV. Psychophysiological Correlates of Professional and Health Status During the Sixth In-service Year

V. Psychophysiological Correlates of Teaching Performance and Affective Behavior During the Seventh In-service Year

CSEIP Technical Report No. 3, November, 1967
University of California, Los Angeles, California

PREFACE

The purpose of this longitudinal study, initiated in 1959, was to investigate the relations of individual differences in personality and functioning of the autonomic nervous system to the behavior, emotional stability and general health of teachers and pupils. The ultimate goal is twofold: (1) the development of predictive indices of value in identifying persons who should be directed toward occupations less stressful than teaching, and (2) the identification of physiological measures useful in evaluating pupil achievement and adjustment. This report presents analyses of data obtained on teachers over a seven-year period. (Work on the pupil phase has been initiated with a sample composed of pupils enrolled in the University Elementary School, UCLA.)

Measurement of teacher characteristics related to teaching style is a concern of the Center for the Study of Evaluation of Instructional Programs. This study seeks to determine if physiological measures of teachers are correlated with indicators of teaching effectiveness. If so, such measures can contribute to a description of the instructional program to which a child has been exposed.

Section I presents the rationale and findings of the initial study, in slightly abridged form, since the collected data provide the basis for all follow-up investigations. In this study a battery of psychological and physiological tests

was administered to 279 female students enrolled in elementary teacher education at UCLA. Normative data concerning the physiological functioning of the autonomic nervous system in adult females were obtained, and the relations of the psychophysiological test data to evaluations of student teaching performance analyzed, (Lucio, Wenger 1961).

After completion of the initial study, and before undertaking the follow-up studies to determine the predictive value of the psychophysiological test battery, the size of the sample was reduced and certain of the analyses of the physiological data were repeated. The reasons for employing a smaller sample, and the results of the re-analyses of the data, are presented in Section II.

The results of the first follow-up study, which involved evaluations of teaching performance in the first year of in-service teaching and their relations to the psychophysiological test data collected in the initial study, are reported in Section III. The results of the second follow-up study, which involved assessments of professional status and health status in the sixth year of in-service teaching and their relations to the original psychophysiological test data, are reported in Section IV. Data have been collected for the third follow-up study concerned with the relations of the psychophysiological test data to teacher interests, affective behavior, organizational satisfaction, and instructional performance; the results will be the subject of a separate report when the analyses are completed.

Support for the initial study was provided by the United States Office of Education, Department of Health, Education and Welfare under Office of Education Contract number SAE 8311. Follow-up investigations were supported in part by the University of California Center for the Evaluation of Instructional Programs and in part by University of California Research Grant number 1761 from National Science Foundation funds.

Appreciation is expressed to the Los Angeles Air Pollution Control District (APCD) for data on atmospheric contaminants and to the Campus Computing Network, UCLA, for computational assistance.

The investigators gratefully acknowledge the generous professional assistance of UCLA faculty members, research assistants and teacher education personnel, and appreciate the cooperation and participation of teachers and administrators, in various California school districts, who made possible the gathering of data for the investigation.

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ABSTRACT

PSYCHOPHYSIOLOGICAL CORRELATES OF FEMALE TEACHER BEHAVIOR AND EMOTIONAL STABILITY: A SEVEN-YEAR LONGITUDINAL INVESTIGATION

The Central purpose of this study was to investigate the predictive validity of a body of psychophysiological data with regard to the performance and emotional stability of female teachers. Analyses of the relations of individual differences in personality and in functioning of the autonomic nervous system (ANS) to measures of teacher behavior, emotional stability, and general health were made: (1) during student teaching, and (2) during the first, sixth, and seventh years of in-service teaching. Normative data on ANS functions in young adult females were obtained and a general autonomic factor was described. The study constitutes the first extensive investigation of functions innervated by the autonomic nervous system in a young adult female population, and the first use of a psychophysiological test battery in research on teacher performance.

Rationale

The investigation was based on the theses that (1) measures of individual differences in ANS functions, be they inherited or acquired, afford a means of predicting those elementary teachers who will be least likely to withstand the stresses involved in teaching; and (2) these measures used in conjunction with selected indices of personality and mental and physical health and controlled appraisals of teaching performance will

provide improved predictive indices of teacher behavior. The justification for testing the value of ANS measures with teachers is derived from many sources. The ANS is known to be involved in emotional behavior and emotional disorders. The work of Wenger and Ellington (1943), Wenger (1948, 1957, 1966) and others (cf. Darrow, 1943; Kuntz, 1951) has shown that individual differences in ANS function are measurable and related to aspects of behavior and personality. The findings summarized by Wenger (1966) indicate that stable individual differences in autonomic functioning during controlled rest exist in both children and adults and that these differences related to certain personality patterns and to certain definable diagnostic categories.

General Procedures

In the first phase of the investigation a battery of psychophysiological tests was administered to 279 non-volunteer female subjects enrolled as students in elementary education at UCLA. Instruments employed were: Guilford-Zimmerman Temperament Survey, Cooperative English Test, Arithmetic Concepts Test, Scale for Rating Characteristic Levels of Muscular Tension, Classroom Observation Record and UCLA Teacher Rating Scale, the latter two instruments administered to obtain records of controlled observations of teaching performance.

The physiological testing procedures (described in detail by Wenger, Clemens, and Engel, 1957) were designed to assay functioning of the autonomic nervous system, and they involved the collection of two classes of information: (1) resting or

pre-stimulus data, and (2) reactions to cold pressor stimulation followed by continued recovery measurement. The specific tests administered were as follows:

(1) Initial Pre-stimulus Physiological Measures: (a) salivary output, (b) sublingual temperature, (c) standing palmar conductance, (d) pupil diameter, (e) finger temperature, (f) dermagraphia latency, (g) dermagraphia persistence, (h) log palmar conductance change, and,

(2) Continuous and Intermittent Physiological Measures: (a) palmar conductance, (b) volar conductance, (c) systolic blood pressure, (d) diastolic blood pressure, (e) pulse pressure, (f) heart period, (g) respiration period, (h) face temperature, (i) axillary temperature, (j) finger temperature, (k) finger pulse volume, and (l) stomach period.

Analysis of the physiological data involved application of transformations to reduce skewness and to effect homogeneity of variances and correction of the measures for the effects of climatic and other uncontrolled variables. Factorial analysis was employed to test the thesis that an autonomic factor existed among young adult women, and factor estimates were computed.

In the second phase of the investigation assessments were made of performance, emotional stability, and professional and health status of the subjects during the first, sixth and seventh years of in-service teaching by a set of instruments developed for this study. These instruments were: Confidential

Teacher Rating Scale (CTRS), General Health Inventory, Professional Status Inventory, Affective Behavior Inventory (ABI), and Instructional Performance Scale (IPS).

Analyses were made of the relations of the psychophysiological test battery to: (1) indices of student teacher performance, and (2) indices of teacher performance, emotional stability, and professional and health status during in-service teaching.

Results

1. Initial study of student teaching performance

a. A general autonomic factor, similar to ones described in previous studies of children and adult males, was found to exist for young adult females.

b. Indices of student teaching performance were positively related to sociability (Guilford-Zimmerman scale S), negatively related to characteristic level of muscle tension, and positively related to finger temperature. A tentative characterization of good teachers as sociable, relaxed, and having a high finger temperature was suggested.

2. First-year follow-up study of in-service teaching performance

a. Unfavorable ratings of performance in the area of classroom behavior were associated with lower scores on the Guilford-Zimmerman scale S, and unfavorable ratings in the area of teacher-parent relations were associated with higher levels of muscle tension. Confirmation was thereby provided for two of the conclusions of the initial study, that teaching performance is positively related to sociability and negatively related to muscle tension.

b. While a few physiological variables were found to be related to ratings of teaching performance, the pattern of these relations did not afford a basis for interpretation in terms of general autonomic balance or imbalance. It was concluded that this first-year follow-up study did not furnish clear evidence of an association between teaching performance and characteristic level of ANS functioning.

c. Ratings of supervised student teaching performance by University staff supervisors and outside observers did not provide any basis for the prediction of school principals' ratings of performance in the first year of in-service teaching.

3. Sixth-year follow-up study of health status and professional status

a. The relations of individual physiological variables, autonomic factor scores and multivariate patterns of autonomic activity to the incidence of psychosomatic and other disorders consistently pointed to an association of relative sympathetic nervous system (SNS) dominance with several kinds of disorders and of relative parasympathetic nervous system (PNS) dominance with an absence of disorders. The strongest tendency toward relative SNS dominance was present among subjects troubled by anxiety and fear. These results are consistent with findings in previous studies of males.

b. No evidence was found to support the hypothesis that a general increase in PNS activity is a feature of certain respiratory disorders. Instead, a specific mixed pattern of PNS dominance in some functions and SNS dominance in others was found to occur with relatively high frequency among subjects having hay fever and/or sinus trouble.

c. Evidence of a relation between autonomic nervous system functioning and success in teaching was provided by the differences between tenured and non-tenured teachers in autonomic factor scores and patterns of autonomic activity. Teachers who showed autonomic imbalance in the direction of relative PNS dominance apparently adjusted least well to teaching; few of them had attained tenure at the time of the study, and a relatively high proportion had left the profession.

d. The previous conclusions that teaching performance is positively related to sociability and negatively related to muscle tension again were supported by the differences between tenured and non-tenured teachers found in this study. These and other differences on the Guilford-Zimmerman scales suggested a characterization of the less successful teachers, in comparison to the more successful ones, as less friendly and sociable, less objective, less active, less emotionally stable, more introverted and more tense. This constellation of tendencies corresponds with the pattern of personality traits which has been reported elsewhere as associated with PNS dominance, and therefore it is consistent with the differences found here between the more and less successful teachers in autonomic nervous system functioning.

e. Ratings of performance in the first year of in-service teaching were found to be of greater value that the original ratings of student teaching performance for the prediction of professional status in the sixth year of teaching. The relations of these ratings to professional status indicated that teachers

whose performance in the first year was rated unfavorably were less likely subsequently to achieve tenure and more likely to spend relatively little time in teaching or to leave the profession altogether than teachers whose performance in the first year was rated favorably.

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I. NORMATIVE DATA ON AUTONOMIC NERVOUS SYSTEM FUNCTIONS, AND PSYCHOPHYSIOLOGICAL CORRELATES OF STUDENT TEACHING PERFORMANCE

1. Introduction

The Problem

The need for improved procedures of teacher selection and evaluation in order to provide for increased numbers of teachers capable of meeting the requirements and stresses of teaching has been recognized by those responsible for teacher education. Generally, research and practice in the prediction and evaluation of teaching performance has reflected an emphasis upon intellectual abilities and achievement. Although the importance of motivation, desirable personality characteristics, and mental health have been recognized, little success has resulted from attempts to measure motivation and few well-designed predictive studies using personality and mental health indices have been reported. Moreover, except for some recognition that temperment plays a role in teaching performance, the investigation of individual differences in physiological functions and their relation to teacher behavior has been neglected (Ryans, 1953).

This study represents a systematic investigation of the relationships of physiological and personality variables to teaching performance and to the emotional stability of teachers, utilizing a sample of female elementary teacher candidates. The physiological aspect of the study is based on

the thesis that measures of individual differences in the functioning of the autonomic nervous system (ANS), be they inherited or acquired, afford a means of predicting those potential teachers who will be least likely to withstand the stresses involved in teaching, and, used in conjunction with selected indices of personality and mental health, will lead to the development of improved predictive indices of teacher performance.

The justification for testing the value of ANS measures in teacher selection and evaluation is derived from many sources. Briefly, the ANS is known to be involved in emotional behavior and emotional disorders. The work of Wenger and Ellington (1943), Wenger (1948, 1957,1966), and that of other researchers (see Reviews by Darrow, 1943 and Kuntz, 1951) has shown that individual differences in ANS function are measurable and are related to aspects of behavior and personality. If stress-prone individuals can be detected in advance and directed toward occupations less stressful than daily classroom teaching, the effect should be salutary for their own mental health and that of the many school children saved from their ministrations.

Another aspect of the problem, that concerned with the selection of methods of teacher assessment, is reflected in Ryans' work in the development of instruments to measure teacher classroom-behavior (1960). The Classroom Observation Record (COR) developed by Ryans and the University of California Rating Scale (UR) were used in the assessment of teaching performance in this study.

In brief, measures of individual differences in the functioning of the autonomic nervous system (ANS) in conjunction with selected indices of personality and mental health were utilized. These measures were correlated in this study against estimates of student teacher performance. They will be validated against in-service teaching performance and information concerning emotional stability and physical health in follow-up studies of these teachers.

Related Research

(A) Teacher Selection. The literature pertaining to investigations of the relationship between various hypothesized predictors and teaching effectiveness is extensive, but in general consists of work which suffers from inadequate considerations of control and lack of replication. Many investigators have failed to specify the conditions of their studies sufficiently to enable comparison of their findings with those of other researchers. Consequently, in spite of the large number of studies purporting to determine concomitants of teacher competency, little usable evidence is available to teacher education specialists or public school personnel officers. Unquestionably the worker in this area is confronted by numerous problems as noted by Lucio (1960, 1967) and Ryans (1960, 1963). Particularly noteworthy are the summaries and analyses of research presented by Gage in the Handbook of Research on Teaching (1963), and the reviews of investigations dealing with the identification and prediction of teaching effectiveness by Morsh and Wilder (1956). These writers have summarized

and analyzed quantitative studies, categorized the methodologies employed, synthesized the findings, and noted perplexing problems. Annotated bibliographies have been provided, also, by Domas and Tiedeman (1950), Castetter, Standlee, and Fattu (1954), and Waters (1954), among others. Ryans (1960), in an investigation of teacher characteristics, presented information on the traits of a sample of 6,000 teachers in 1,700 elementary and secondary schools and contributed knowledge on the kinds of personality traits which make one teacher more effective than another.

(B) ANS Measurement. In 1939 Wenger and his associates initiated work designed to measure individual differences in physiological functions which gave promise of being correlated with overt behavior. The work involved the measurement of a number of autonomically innervated functions in a population of children, the intercorrelation and factorial analysis of the data, and the estimation of the obtained autonomic factor for the individual children. Such factor estimates were called "Scores of Autonomic Balance." These studies with children (1943) and with adults (1948, 1957) led to conclusions which were summarized by Wenger, Engel, and Clemens (1957). Particularly pertinent are the following conclusions:

1. Stable individual differences in autonomic functioning during controlled rest exist in both children and adults.

2. These differences are related to certain personality patterns and to certain diagnostic categories, such as

anxiety psychoneurosis, schizophrenia, battle fatigue, and asthma.

3. For greatest predictive value, measures of autonomic balance and patterns during rest should be supplemented by measures of reactions to a standard stimulus.

Wenger has continued to publish extensively in the field. His current work, in one laboratory, involves studies of psychosomatic patients; in another, male students have been used in a series of normative studies of ANS reactions to a wide variety of stimuli. The present study with females represents a cooperative effort to expand psychophysiological research to a new area of investigation.

Hypotheses

(A) Individual differences in autonomic response patterns furnish a basis for the prediction of those individuals who cannot well withstand the stress of teaching and those who may develop specific psychosomatic and other psychological disorders, and (B) such measures will improve the predictive value of psychological correlates of teacher performance.

2. Subjects and Procedures

The over-all plan of the initial research involved physiological and psychological testing of students enrolled in teacher education, and subsequent evaluation by trained observers of the teaching performance of the subjects during student teaching. The sample was limited to elementary teacher candidates because of the important role the elementary teacher plays in the mental health of the child. Because the

majority of candidates were females, the sample was confined to women subjects.

Subjects

The subjects were 279 women, most juniors in the University, all candidates for the general elementary teaching credential. They were enrolled in the upper division course required of all prospective elementary teachers; participation in the physiological testing was required as a part of the testing program for all such teacher-candidates. Their ages ranged from 20 to 42 with a mean age of 22.7; only ten were over 30 years of age.

Prior to the period of physiological testing all subjects had been routinely screened for entrance to the teacher education program by the Office of Student Services of the Department of Education. Screening measures included proficiency in communication skills, assessment of the quality of academic work, and health and personal fitness.

Of the total of 279 subjects, 240 were later enrolled in student teaching at which time observations and recordings were made of teaching performance. Although a larger number of subjects was available for testing, the final sample usable in any of the analyses was reduced for one or more of the following reasons: no potential subject who was pregnant, under continuing medication, or whose menstrual cycle was aperiodic was tested. Some potential subjects who broke their testing appointments or who were ill, or who had high sublingual temperatures were not available for re-scheduling and testing.

Some subjects dropped from the teacher education program before or after they had received physiological testing; while others were tested but had not yet enrolled in student teaching at the termination of the research contract. The number of subjects thus varies in different portions of the analyses. All 279 subjects received physiological testing but adequate data were obtained for only 247. Of these, 217 received one or more evaluations of student teaching performance.

Psychological Testing

As a part of the group testing program for all teacher education candidates a number of psychological tests are regularly administered by the Office of Student Services. However, due to various administrative reasons beyond the control of the researchers, a number of subjects who participated in this study were not given the complete selection battery and hence scores from several of the tests were not available. These differences are accounted for in the analyses presented in the sections which follow. The scores from three of the tests administered by the Office of Student Services were available for use in this study. The tests included the Guilford-Zimmerman Temperament Survey, the Cooperative English Test, and an Arithmetic Concepts Test (locally developed by the Office of Student Services).

The Guilford-Zimmerman Temperament Survey (G-Z) is described in detail in the Manual of Instructions for the test (published by Sheridan Supply Company, Beverly Hills, California). Briefly, the test is designed to sample ten

traits with 30 items for each of the ten traits (see Appendix F). It is claimed that tne G-Z Survey is a systematic, impersonal interview, which can be objectively scored. The items in the G-Z Survey are stated affirmatively rather than in question form, using the second-person pronoun. The alternative responses to the 300 items in the G-Z Survey are: "Yes," "?", and "No." From the total "Yes" and "No" answers a total score was obtained for each of the ten separate traits. At the suggestion of Zimmerman to one of the investigators (Lucio), total question marks also were scored as a separate index.

An additional index was obtained by means of a Scale for Rating Characteristic Level of Muscular Tension. This instrument, developed by Wenger (1948, Appendix B), was employed after observing the subjects in teaching situations. The observers placed a check mark at an appropriate point on a vertical scale. No scoring formula was shown on the rating scale, but a nine point scale was later applied for scoring, ranging from a 0 for the lowest scale point ("so relaxed he looks and acts almost asleep") to a 9 for the top of the scale ("tense"). All observers were trained in the use of the Muscular Tension Scale (MT) with particular emphasis given to rating observed overt muscular tension only, without regard to "emotional" behavior.

Physiological Testing

As stated previously, nonvoluntary subjects were scheduled for physiological testing in a class in which all teacher-education candidates were required to enroll. The following

instructions were given both verbally and in printed form to the subjects prior to testing:

1. Get an average satisfactory amount of sleep the night before the appointment.
2. Do not take any drugs (medications) or alcohol for a twenty-four hour period preceding the appointment.
3. Do not take food, coffee, tea, or coca-cola for at least two hours preceding the appointment.
4. Do not smoke or drink water for at least 1/2 hour preceding the appointment.

The laboratory was situated in the University Elementary School on the University of California campus. Within a large room, which contained the recording apparatus and work space, a semi-soundproof cubicle (10' x 8' x 8') served as the subject room. The room contained only a cot, with foam-rubber mattress, and the detector units for the intended measurements. A two-way intercommunication system was provided, and the subject could be observed through a window. Room temperature could be controlled within limits ($M=25.0$; $\sigma=1.8$) but was determined for each testing session and treated as an uncontrolled variable. Time of testing was confined to the morning and afternoon hours (8:30 a.m. to 4:30 p.m.), and also was analyzed as an uncontrolled variable.

The testing procedures have been used in many investigations of male subjects, and have been described in detail (Wenger, 1948; Wenger, Clemens and Engel, 1957). Briefly, they involve the collection of two classes of information - resting or pre-stimulus data, and reactions to placing the

right foot in iced water, to the level of the internal malleolus, for one minute (cold pressor stimulation).

The methods of obtaining and transcribing the data are briefly described in the following paragraphs.

A. Pre-stimulus Data - Initial Measures

(1) Salivary output: The subject was seated on the cot and instructed to bring as much saliva as possible to the front of her mouth during a three-minute period. The output was drawn through a sanitary plastic ejector held just between her lips and into a calibrated centrifuge tube by means of the negative pressure produced by a filter pump attached to a water faucet. The output was determined by reading the volume at the bottom of the miniscus to the nearest tenth of a cubic centimeter, and the datum was transformed to square root of cubic centimeters output.

(2) Sublingual temperature: This measure was obtained with an ordinary clinical thermometer which the subject, while seated, held under her tongue for at least three minutes. The temperature was read in degrees Fahrenheit to the nearest tenth and transformed to the log of 102 F. minus the temperature.

(3) Standing Palmer conductance: The subject was instructed to stand in a relaxed position, feet slightly apart, and arms at her side. The electrodes attached to both palms consisted of zinc plates 3 cm. in diameter, countersunk in plastic cups. Contact with the skin was made with an agar-1% zinc sulfate paste. The electrodes were connected to a

Levine potentiometer. The voltage drop across the subject was recorded to the nearest tenth of a volt at the end of one and two minutes with a 40 microampere D.C. current. These values were converted to conductances and their mean was transformed to log micromhos conductance.

(4) Pupil diameter: Over her preferred eye the subject held a 5 x 8 inch black card on which pairs of pinpoint holes were drilled along converging lines so that the distances between pairs increased in half-millimeter steps from 2.5 to 8.0 mm. The other eye was covered by one hand. Through the holes she fixated an object 30 feet away, moving the card up and down until she found the pair of holes which provided tangent images. The images may appear as over-lapping, separated, or tangent depending on their relationship to the size of the pupil. When the center-to-center distance between the holes is equal to the diameter of the pupil the images appear tangent, and the experimenter can read the pupil diameter from the opposite side of the card. The process was repeated until two consistent readings were obtained, and the datum was their value in millimeters.

(5) First finger temperature: The first measure of finger temperature was obtained with a laboratory thermometer while the subject was seated. The subject held the bulb between the thumb and first two fingers of the nonpreferred hand for three minutes. The temperature was read in degrees Centigrade to the nearest tenth and transformed to the log of 40 C. minus finger temperature.

(6) Dermographia latency: After the subject had reclined on the cot, red dermographia was elicited by the application of the rounded point of a stimulator calibrated to deliver 200 gm. pressure. The pattern of an X was made over the left biceps muscle by two strokes, each approximately 3 inches long and requiring about one second. At the incidence of the first stroke the experimenter started a stopwatch, and the latency of the red X response was recorded to the nearest second.

(7) Dermographia persistence: The disappearance of the red X produced by the dermographia stimulator was recorded in minutes to the nearest tenth, and the datum transformed to log minutes.

(8) Log palmar conductance change: This measure represented the greatest difference between palmar conductance during rest and during muscular strain. The measure during strain was obtained immediately after the standing measure previously described, using the same apparatus. The subject sat on a stool with arms outstretched and hands relaxed. She was instructed to raise her legs as high as possible and to "keep straining very muscle." The potentiometer was continuously adjusted so that a 40 microampere current flowed through the subject, and the lowest voltage drop during one minute of strain was recorded to the nearest tenth of a volt and converted to log micromhos conductance. While the subject later was reclining prior to cold pressor stimulation, palmar resistance was continuously recorded with the same electrodes, but by means of a Darrow-type bridge with a range of 500,000 ohms.

A constant current of 40 microamperes was impressed through the electrodes and the output was DC amplified. Calibration was determined by bridge regulation. The highest resistance during the first 12 minutes of recording was determined and transformed to log micromhos conductance. This measure was subtracted from the strain measure to obtain the datum for log conductance change.

B. Pre-stimulus Data - Continuous and Intermittent Measures

The twelve variables, described in this section, were recorded continuously or intermittently while the subject reclined on the cot before, during and after cold pressor stimulation. Except in the case of blood pressure and stomach motility, samples were obtained: (a) in the last 30 seconds of each minute during 15 minutes of rest preceding stimulation; (b) for each 30 seconds during stimulation and during the first minute after stimulation; and (c) in the last 30 seconds of each minute during a 15 minute recovery period. The variables were:

(1) Palmar conductance: The recording technique for this variable was described in the preceeding section. Each sample consisted of the mean of the resistance levels measured to the nearest thousand ohms, at the midpoint and end of the thirty-second interval, and transformed to log micromhos conductance.

(2) Volar conductance: The apparatus and recording procedures were identical to those employed for palmar conductance. Electrodes were placed on the volar surfaces of the

forearms, 8-10 cm. below the elbows. Samples were obtained in the same manner as for palmar conductance. The pre-stimulus datum was the highest resistance level during the first 12 minutes of rest. This measurement was transformed to log micromhos conductance.

(3) Systolic blood pressure: A standard Tycos pressure cuff was attached to the subject's upper right arm, and a small stethoscope diaphragm was fastened over the brachial artery. Tygon tubing extended the system to the experimenter's room. The cuff was inflated once every three minutes before cold pressor stimulation, once during stimulation, and once every two minutes following stimulation. Systolic blood pressure was read in millimeters of mercury as the point of first appearance of heart sounds. The pre-stimulus datum was the mean of the two lowest readings.

(4) Diastolic blood pressure: The point of marked muffling of the heart sounds during gradual deflation of the cuff (4th blood pressure phase) was taken as the diastolic blood pressure reading. The pre-stimulus datum was the mean of the two readings accompanying those used for systolic pressure.

(5) Pulse pressure: The datum for this measure was the difference between the systolic and diastolic pressure data.

(6) Heart period: The EKG was obtained from continuous AC recording by Lead I with standard electrodes. Heart rate for each sample interval was measured by counting the number of R waves within the interval. For the pre-stimulus value,

each sample was converted to mean period in milliminutes per 10 cycles, and the datum was the mean of 4 of the samples, taken at 3 minute intervals during the first 12 minutes of recording.

(7) Respiration period: A Baldwin SR-4 strain gauge was cemented to an aluminum plate attached to a strap which fastened around the subject's chest. The strain gauge functioned as one arm of a Wheatstone bridge, the output of which was DC amplified. Respiration rate was determined by counting the cycles within each sample interval to the nearest tenth cycle. For the pre-stimulus value, each sample was converted to mean period in seconds per cycle, and the datum was the mean of 4 of the samples, taken at 3 minute intervals during the first 12 minutes of recording, transformed to log seconds per cycle.

(8) Face temperature: Temperatures of the face, axilla, finger, and room temperature were recorded through a DC amplifier by means of Western Electric type 14B thermistors, each of which functioned as one arm of a Wheatstone bridge. All temperatures were recorded on one channel by means of a constant speed, motor-driven, selector switch which sampled face and axillary temperatures once and finger temperature twice every ten seconds. Room temperature was sampled approximately every three minutes. Calibration was accomplished by substituting known resistances for the thermistors, whose resistances at given temperatures had been predetermined. Face temperature was recorded from a thermistor attached with

plastic tape to the center of the right cheek. The reading for each sample was the level in degrees Centigrade to the nearest tenth at the end of the sample interval. The level for the last sample prior to stimulation was taken as the pre-stimulus datum.

(9) Axillary temperature: A thermistor was mounted on a sponge rubber pad and placed in the right axilla, where it was held in contact with the skin by the pressure of the subject's arm. The datum for this variable was obtained in the same manner as for face temperature.

(10) Finger temperature: A thermistor was attached to the palmar surface of the tip of the left index finger by plastic tape. The datum for this variable was obtained in the same manner as for face and axillary temperatures, and transformed to the log of 40C. minus the temperature. "Second Finger Temperature" was the last reading prior to stimulation.

(11) Finger pulse volume: A plastic cup was sealed over the left index finger so that 4 cc. were enclosed, and connected by Tygon tubing in a closed pressure system to a Statham P97 transducer used as a gauge transducer. Calibration was accomplished by switching a resistor in parallel with one arm of the transducer bridge to produce a pen displacement equal to that produced by a digital blood volume change of 5 microliters. Amplification was AC. Each sample consisted of the average amplitude in microliters to the nearest hundreth of the volume changes produced by the arterial pulse waves within the sample interval, as measured from the zero base of the AC channel. Each sample measure was transformed to the log of

microliters X 100, and the pre-stimulus datum was the measure for the last sample prior to stimulation.

(12) Stomach period: The subject swallowed a 3/16" x 1/2" plastic coated Alnico No. 5 magnetic rod enclosed in a gelatin capsule. The movements of the magnet in the stomach were remotely detected and amplified by a magnetometer. The peak-to-peak distance between the first and last Type I stomach contraction within each minute was measured to the nearest half second before, during, and after stimulation; and each measurement was converted to mean seconds per cycle of contraction. The last sample prior to stimulation was taken as the pre-stimulus datum.

C. Reactivity Data

The reactivity datum for each of the continuously or intermittently recorded variables represented the difference between the level reached during or immediately after cold pressor stimulation and the level for the last sample prior to stimulation. For three variables the unit of measurement differed from that previously described. Heart and respiration rates were measured as cycles per minute, and finger temperature was measured in degrees Centigrade without a log transformation. The response levels from which the corresponding last pre-stimulus samples were subtracted were as follows:

(1) Systolic blood pressure: Highest pressure in millimeters of mercury recorded during the stimulus interval and the first subsequent minute.

(2) Diastolic blood pressure: Highest pressure in millimeters of mercury recorded during the stimulus interval and the

first subsequent minute.

(3) Pulse pressure: Lowest pressure in millimeters of mercury recorded during the stimulus interval and the first subsequent minute.

(4) Heart rate: Maximum rate for any 15-second period within the stimulus interval, measured to the nearest half cycle and converted to cycle per minute.

(5) Respiration rate: Maximum rate for any 15-second period within the stimulus interval, measured to the nearest tenth cycle and converted to cycles per minute.

(6) Palmar conductance: Lowest resistance within the stimulus interval, measured to the nearest thousand ohms and transformed to log micromhos conductance.

(7) Volar conductance: Lowest resistance within the stimulus interval, measured to the nearest thousand ohms and transformed to log micromhos conductance.

(8) Face temperature: Highest or lowest level in degrees Centigrade to the nearest tenth reached following stimulation as a result of an increase or decrease in level initiated within the stimulus period or the first subsequent minute.

(9) Axillary temperature: Highest or lowest level in degrees Centigrade to the nearest tenth reached following stimulation as a result of an increase or decrease in level initiated within the stimulus period or the first subsequent minute.

(10) Finger temperature: Lowest level in degrees Centigrade to the nearest tenth reached following stimulation as a result of a decrease in level initiated within the

stimulus period or the first subsequent minute.

(11) Finger pulse volume: Lowest mean amplitude for any 15-second period within the stimulus interval, measured in microliters to the nearest hundreth and transformed to the log of microliters X 100.

(12) Stomach period: Shortest peak-to-peak distance between the first and last contractions of any one-minute period within the stimulus interval and the first subsequent minute, measured to the nearest half-second and converted to mean seconds per cycle of contraction.

Testing Procedure

Approximately an hour and a half to two hours was required for the physiological measurements. Since the sex of the operator has been found to influence results obtained from female subjects, all operators for this study were females; and since phase of menstrual cycle also influences results, testing was confined insofar as possible to a seven-day period following cessation of menstruation.

On arrival at the laboratory the subject was seated and the experimenter explained the nature of the measurements and offered reassurance that the procedure would be painless. Data on age, weight, height, and smoking habits were obtained at this time. While sublingual temperature and first finger temperature were being measured, the skin conductance electrodes were applied. Next, pupil diameter, salivary output, and standing and strain palmar conductances were measured. The subject then ingested the magnet with a cup of water and

reclined on the cot in the test cubicle. Dermographia was measured, and the various other electrodes and pick-up devices were explained and placed. The subject was told to lie as quietly as possible but not to fall asleep.

After continuous recording with the subject at rest for fifteen minutes, the operator instructed the subject, via the intercommunication system, to put her foot into the water and keep it there until the signal to remove it was given. A container placed to the right of the cot held iced water at a temperature of approximately 4 degrees Centigrade, which covered the foot to the level of the external malleolus. The stimulus interval was one minute. Following stimulation, recording continued throughout a fifteen minute recovery period to the termination of testing.

The Student Teaching Program

The student subjects in this study were enrolled in the regular sixteen-week student teaching program of the university in the semester following testing. There are two eight-week teaching assignments each at a different grade level. Students are assigned to a classroom in one of several co-operating schools, teaching under the direction of a resident classroom teacher. A University Supervisor of Elementary Student Teaching is assigned full time to each school and supervises a relatively small number of student teachers. These supervisors who are regular members of the University-Los Angeles City Schools staff served as supervisor observers throughout the study. The principal investigator and one assistant served as outside observers.

The Evaluation of Student Teaching

In the initial planning of a long-term research concerning the prediction of teacher performance, the evaluation of student teaching was envisaged as only one of the indices to be employed in attempting to predict teaching performance and emotional stability. In this study, however, it provides the major criterion variables against which tentative validations of the psychological and physiological data were accomplished. It should be emphasized that the authors do not regard these samples of student teacher performance as appropriate validation criteria. At best, they can afford no more than suggestions of the predictive value of the psychological and physiological data. In follow-up studies, which are planned, they will be employed as part of prediction information only.

Instruments Employed in Evaluation

Two instruments were used in the evaluation of student teacher performance:

(A) The University of California Rating Scale for Student Teaching (UR), (Appendix E), was filled out by the university supervisors at the end of sixteen weeks of teaching for each subject. This instrument contains two major rating categories, one on Personal Characteristics and one on Professional Competence. Each of these major categories contains a number of sub-items, all of which are rated by the assignment of a letter grade of A, B, C, D, or F, with A reflecting top performance and F the lowest performance.

Numerical scores are assigned to each letter grade and the total score is obtained by summary of the individual letter numerical equivalents. In essence, the final total score reflects the academic grade a student receives in student teaching. The total over-all numerical score on the UR was used for correlational purposes in this study.

(B) The Classroom Observation Record (COR). This instrument and accompanying Glossary, developed by Ryans (1960, Appendices C and D), was used for all observations of classroom teaching and was considered the major measure of student teacher performance. The Classroom Observation Record is a bi-polar scale based on the assumption that many personal-social traits of teachers may be assumed to constitute dimensions, the opposite extreme poles of which can be described operationally with considerable precision. The COR contains four Pupil Behavior and eighteen Teacher Behavior dimensions each of which is assessed on a seven point, or seven interval scale. A Glossary used with the COR describes the specific behaviors contributing to each of the bi-polar descriptions of teacher and pupil behavior.

Observer Training in the Use of the Classroom Observation Record

In preparing for classroom observations of student teachers particular attention was given to the training of the supervisor observers in the use of the COR. The supervisor observers were trained individually and in a group by the principal investigator following Ryans' procedures (1960).

The training procedure involved the following steps:

1. A review of the over-all design and purposes of the study and the use of the COR and Glossary. The problems involved in the observation and assessment of teaching were discussed in detail.

2. The observers studied the COR and Glossary and questions regarding interpretation and procedures were answered.

3. Practice observations and recordings of teaching performances were accomplished by the supervisor observers and project director.

4. Comparisons were made between the supervisors' ratings and the principal investigator's ratings (outside observer), and the bases for assessments and the use of the Glossary clarified.

5. Supervisors and outside observers made observations of the same student teachers, but at different times, and later discussed the assessments which had been made.

6. Regular observations of approximately thirty minutes each were then conducted at the end of each period of teaching, generally during the last week and a half of the eight-weeks and sixteen-weeks period.

The observations and ratings of the supervisors and outside observers were conducted independently. The outside observers had no prior knowledge of the teaching performance of any students observed. The use of the COR and Glossary were reviewed with the observers before and during rating periods. During regular visits of the principal investigator to the

various schools conferences were held with individual supervisors regarding rating procedures so that an almost continuous review of the assessment process was in operation.

The assessment procedure used in this study, therefore, involved five ratings of each student teacher, the observations being made at different times by the supervisor observers and the outside observers. The four independent ratings on the COR (and the one rating on the University of California Rating Scale) thus became the complete teaching performance record for each student teacher subject. Though ratings were made at eight-weeks and sixteen-weeks, only data on the final sixteen-week record were used, the earlier ratings being considered as practice ratings.

Statistical Analyses of the Data

The major form of analysis involved correlation of the psychological and physiological data against the various indices of student teacher performance. The psychological test data and the rating of teacher performance were employed without transformations. Many of the physiological data, however, required transformations to reduce skewness of the distributions, and many required correction for uncontrolled variables. These transformations and corrections are described in the following section.

After transformation and correction the physiological data were submitted to factorial analysis to test the thesis that an autonomic factor existed among young adult women comparable to that previously reported for children and young adult men. Equations were derived for estimating the obtained

factors in the population studied; the factor estimates were computed and correlated with the criterion variables. These analyses were facilitated by the availability of an IBM 7090 Digital Computor and the Standards Western Automatic Computor (SWAC) on the campus of the University of California, Los Angeles.

3. Transformations and Corrections of the Physiological Data for Effects of Uncontrolled Variables

For psychological data it is usual to find normal distributions. For physiological data it is not unusual to find skewed or otherwise nonnormal distributions. An attempt was made to normalize, by appropriate transformations, all of the physiological variables whose distributions differed significantly from the normal. For the pre-stimulus data transformations were applied, as indicated by the units of measurement listed in Table 1-G, to salivary output, sublingual temperature, palmar and volar conductance, palmar conductance change, respiration period, dermographia persistence, finger temperature, and finger pulse volume. The distributions of the transformed data for some variables (sublingual temperature, dermographia persistence and first finger temperature), and of the raw data for face and axillary temperature, still showed a degree of nonnormality significant at the .05 level of confidence; however, all except that of axillary temperature were symmetrical. The elimination of skewness was the most important consideration in these transformations, since violations

of the assumption of normality tend to have little effect upon the results of parametric statistical tests unless the distributions involved are asymmetrical. The distributions of the pre-stimulus data therefore were regarded as satisfactory except that of axillary temperature, for which an appropriate normalizing transformation has not yet been found.

Measures of reaction to cold pressor stimulation involved the same transformations as the corresponding measures of pre-stimulus levels, with two exceptions: (a) reactions in heart and respiration were measured as rate instead of period, and were not transformed; and (b) finger temperature reactions were measured in degrees Centigrade, untransformed (see Table 1-H). The distributions for systolic and diastolic blood pressure, face temperature, finger pulse volume and stomach period reactions were significantly non-normal but symmetrical. The distributions for palmar and volar conductance, and axillary temperature, however, were skewed in addition to being non-normal. The skewness of the distribution of volar conductance reactions was so extreme that this measure was not used in any data analyses. The skewness of the other variables was much less than that of volar conductance, but still sufficient to raise some questions as to the suitability of these measures for parametric statistical analysis. For the time being, these measures have been utilized in their present form, but further attempts are being made to find transformations which will make their distributions more symmetrical.

After these transformations the data were inspected for effects of uncontrolled variables. It was anticipated that some of the physiological data would have to be corrected for some uncontrolled environmental variables, and possibly for age and weight. Early work with children had demonstrated that seasonal climate in the mid-west of the United States was an important factor (Wenger, 1943). Later work with young adult males at Santa Ana, California (Wenger, 1948) found it necessary to correct only four physiological variables in terms of two uncontrolled variables: time of day, and room temperature. Current work in Los Angeles with young adult males, however, has found additional corrections necessary.

The subjects and circumstances of this study afforded the largest sample and most varied environmental conditions so far available for such an investigation. Measurements occurred between October 27, 1959, and August 17, 1960, on the University of California Campus in West Los Angeles. Although "smog" rarely causes distress in the area it is discernible at times. In this study, and in other contemporaneous work, its possible effects on the measures have been investigated. The data were made available by the Los Angeles Air Pollution Control District (APCD). They included average and maximum daily concentrations of total oxidants, precursor oxidants, carbon monoxide, nitrogen dioxide, nitrogen monoxide, ozone, and sulphur dioxide; and average daily solar radiation, wind speed and inversion base height. In addition, the Department of Meteorology on the University of California campus furnished continuous measurements of air temperature, relative humidity, and barometric pressure.

The distributions of some of the atmospheric contaminant measures were positively skewed. Log transformations were applied to the measures of precursor oxidants, carbon monoxide, nitrogen dicxide, nitrogen monoxide, ozone and sulphur dioxide concentrations in order to normalize their distributions. None of the other uncontrolled variables was transformed.

Of these variables, and others obtained (room temperature and time of testing), partial correlations demonstrated that most could be excluded from further consideration, at least for our present purposes. Table 1-A shows the correlation coefficients of the pre-stimulus physiological data against the uncontrolled variables that appear to be most important.** Table 1-B shows comparable coefficients for reactions to cold pressor stimulation, and shows also the relationships to the pre-stimulus baselines.

The results clearly indicated that corrections were necessary. In particular, five uncontrolled variables - time of testing, initial room temperature, external temperature at the time of testing, and lowest relative humidity and highest barometric pressure in the 24 hours prior to testing - were prominent. It was decided to correct each physiological variable for all five of these uncontrolled variables if correction for any one of the five was indicated by correlation

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** For the physiological data of Tables 1-A, 1-B, 1-C 1-F, 1-G, and 1-H, the maximum N was 247 and the minimum N (for stomach period reaction) was 68. Most variables involve N's of 200-245. The N's for evaluations of student teacher performance appear in the Table 1-O, page 48; those for Guilford-Zimmerman scores and muscle tension ratings appear in Table 1-R, page 52.

Table 1-A

CORRELATIONS OF PRE-STIMULUS PHYSIOLOGICAL MEASURES WITH UNCONTROLLED VARIABLES

	A	W	Ti	RT	T	H	P	Ox
Salivary output	-17	07	02	-04	-04	03	07	-08
Sublingual temperature	04	09	-22	21	-10	-30	29	-10
Palmar conductance	-12	-03	10	15	14	-21	13	-04
Volar conductance	12	07	03	12	-06	-13	18	02
Log conductance change	-06	17	-03	22	05	-21	15	07
Systolic blood pressure	02	15	-09	-11	08	09	-05	20
Diastolic blood pressure	18	16	-24	-10	06	-03	14	21
Pulse pressure	-13	03	09	-03	02	10	-14	00
Heart period	01	14	-16	-03	-02	03	-04	-02
Respiration period	04	09	-13	15	01	-09	15	01
Pupil diameter	-07	-02	-06	-11	-04	-02	-03	-10
Dermographia persistence	-19	-02	-09	02	-05	-19	13	-02
Dermographia latency	07	12	02	-0[illegible]	10	-10	-01	-03
Face temperature	04	00	31	47	-12	-19	40	-11
Axillary temperature	07	-20	23	02	-01	03	00	-11
Finger temperature (1)	-06	-12	-23	-13	-37	-08	10	-25
Finger temperature (2)	-06	-06	-15	-36	-17	08	-12	-15
Finger pulse volume	-04	00	14	01	31	08	-15	20
Stomach period	-08	11	-12	04	-16	06	-01	05

A = age
W = weight
Ti= time of testing
RT= initial room temperature
T = external temperature at time of testing
H = lowest relative humidity in previous 24 hours
P = highest barometric pressure in previous 24 hours
Ox= maximum oxidant concentration on test day

Table 1-B

CORRELATIONS OF PHYSIOLOGICAL REACTIONS TO COLD PRESSOR STIMULATION WITH UNCONTROLLED VARIABLES

	A	W	Ti	RT	T	H	P	Ox	Base
Systolic blood pressure	04	-04	12	-12	08	-05	-05	02	-16
Diastolic blood pressure	04	04	11	-00	13	01	05	08	-31
Pulse pressure	02	-03	-01	-06	-04	-08	-06	-04	-39
Heart rate	-08	05	01	-01	12	-16	09	09	-22
Respiration rate	-02	05	-11	05	-10	-08	10	01	-29
Palmar conductance	-13	-06	05	15	13	-25	15	-06	21
Finger temperature	12	03	-06	07	-02	-08	05	-08	-36
Face temperature	-01	03	04	-07	07	07	-06	06	-15
Axillary temperature	06	07	00	02	20		03	13	-05
Finger pulse volume	-00	-08	-18	-14	-19		-06	-09	-58
Stomach period	-07	08	11	07	11	-06	-02	02	-38

A = age
W = weight
Ti= time of testing
RT= initial room temperature
T = external temperature at time of testing
H = lowest relative humidity in previous 24 hours
P = highest barometric pressure in previous 24 hours
Ox= maximum oxidant concentration on test day
Base= pre-stimulus baseline

Table 1-C

MEANS AND STANDARD DEVIATIONS OF UNCONTROLLED VARIABLES, AND THEIR INTERCORRELATIONS

	Unit of measurement	Mean	S.D.	Correction Baseline*	Intercorrelations A	W	Ti	RT	T	H	P
Age	Years	22.7	3.9	22.0							
Weight	Pounds	122.4	15.2	120.0	13						
Time of testing	Hours	12.4	2.6	11.0	-14	-12					
Room temperature	C.	25.0	1.8	24.0	13	07	26				
Exterral temperature	F.	63.9	7.2	65.0	10	06	15	07			
Lowest relative humidity previous 24 hours	Per cent	38.2	18.8	40.0	-04	-07	06	-37	-28		
Highest pressure previous 24 hours	Barometric inches	30.09	.10	30.05	11	05	05	53	-05	-57	
Maximum oxidant concentration test day	Parts/100 million	10.9	6.8	5.0	15	12	-02	01	50	-05	-07

*The correction baseline is the arbitrary value used in place of the sample mean in the correction equations for the resting and reactivity physiological measures.

and inspection of trend. As a result of this decision all but one (dermographia latency) were corrected. In addition, some variables were corrected for age, weight, or oxidant concentration, as indicated by the analyses; and all physiological reactivity data were corrected for pre-stimulus baseline effects.

Table 1-C shows the means and standard deviations of the uncontrolled variables that appear in Tables 1-A and 1-B; and presents also their coefficients of intercorrelation, as well as the arbitrary baseline values employed in the correction equations. The correction equations appear in Tables 1-D and 1-E, and Table 1-F presents the uncorrected pre-stimulus means and standard deviations upon which the corrections of physiological reactions to cold pressor stimulation were based. It should be noted that, for purposes of convenience, arbitrary baseline values were employed instead of the sample means. These "correction baseline" values also appear in Tables 1-F and 1-C. The means and standard deviations of the corrected data are presented in Tables 1-G and 1-H.

4. Factorial Analyses of the Corrected Physiological Data

After correcting the physiological data, as described in the preceding section, the next step in the analysis of the results was to test the hypothesis that an autonomic factor exists for young adult female subjects. Earlier work had demonstrated such a factor under resting and other controlled conditions for children (Wenger and Ellington, 1943), and for young adult males and selected male patients,

Table 1-D

EQUATIONS FOR CORRECTION OF PRE-STIMULUS PHYSIOLOGICAL MEASURES

Salivary output	$z_c = z_x - .04z_3 + .11z_4 - .09z_6 - .18z_7$
Sublingual temp.	$z_c = z_x - .04z_2 + .22z_3 - .15z_4 + .13z_5 + .21z_6 - .09z_7$
Palmar conductance	$z_c = z_x + .14z_1 - .05z_3 - .10z_4 - .09z_5 + .17z_6 + .022_7$
Volar conductance	$z_c = z_x - .12z_1 - .06z_3 - .01z_4 + .11z_5 + .10z_6 - .10z_7$
Log conductance change	$z_c = z_x + .12z_1 - .15z_2 + .07z_3 - .21z_4 - .01z_5 + .14z_6 + .03z_7$
Systolic blood pressure	$z_c = z_x - .13z_2 + .06z_3 + .11z_4 - .05z_5 - .14z_6 - .10z_7 - .18z_8$
Diastolic blood pressure	$z_c = z_x - .10z_1 - .11z_2 + .19z_3 + .20z_4 - .04z_5 - .13z_6 - .33z_7 - .19z_8$
Pulse pressure	$z_c = z_x + .11z_1 - .06z_3 - .05z_4 - .02z_5 - .04z_6 + .13z_7$
Heart period	$z_c = z_x - .12z_2 + .16z_3 - .03z_4 - .04z_6 + .03z_7$
Respiration period	$z_c = z_x + .19z_4 - .16z_4 - .05z_5 - .06z_6 - .11z_7$
Pupil diameter	$z_c = z_x + .05z_1 + .01z_3 + .12z_4 + .10z_5 + .11z_6 + .03z_7$
Dermogr. persist.	$z_c = z_x + .21z_1 + .10z_3 + .03z_4 + .04z_5 + .17z_6 - .07z_7$
Face temperature	$z_c = z_x - .25z_3 - .30z_4 + .18z_5 + .02z_6 - .21z_7$
Axillary temp.	$z_c = z_x + .17z_2 - .22z_3 + .03z_4 + .04z_5 + .01z_6$
Finger temp. (1)	$z_c = z_x + .11z_2 + .14z_3 + .17z_4 + .32z_5 + .20z_6 - .06z_7 + .12z_8$
Finger temp. (2)	$z_c = z_x + .02z_3 + .39z_4 + .17z_5 + .10z_6 - .03z_7$
Finger pulse volume	$z_c = z_x - .07z_3 - .07z_4 - .33z_5 - .14z_6 + .09z_7$
Stomach period	$z_c = z_x + .14z_1 - .10z_2 + .19z_3 - .14z_4 - .07z_5 - .16z_6 - .03z_7$

Z_c = corrected standard score
Z_x = uncorrected standard score
1= age
2= weight
3= time of testing
4= initial room temperature
5= external temperature at time of testing
6= lowest relative humidity in previous 24 hours
7= highest barometric pressure in previous 24 hours
8= maximum oxidant concentration on test day

$z = (X_i - B_i)/\sigma_i$ where the values of B_i are the correction baseline values shown in Table 1-C and X_i is the raw score

Table 1-E

EQUATIONS FOR CORRECTION OF PHYSIOLOGICAL REACTIONS TO COLD PRESSOR STIMULATION

Systolic blood pressure	$z_c = z_x - .17z_3 + .22z_4 - .04z_5 - .13z_6 + .02z_7 + .15z_p$
Diastolic blood pressure	$z_c = z_x - .03z_3 + .13z_4 - .20z_5 - .14z_6 - .24z_7 + .34z_p$
Pulse pressure	$z_c = z_x - .07z_3 + .04z_4 + .11z_5 + .21z_6 + .21z_7 + .40z_p$
Heart rate	$z_c = z_x - .07z_3 + .12z_4 - .08z_5 + .15z_6 - .07z_7 + .23z_p$
Respiration rate	$z_c = z_x + .05z_3 + .12z_5 + .09z_6 - .01z_7 + .28z_p$
Palmar conductance	$z_c = z_x + .14z_1 + .01z_3 - .09z_4 - .07z_5 + .22z_6 + .02z_7 - .20z_p$
Finger temp.	$z_c = z_x - .12z_1 + .03z_3 - .22z_4 + .02z_5 + .05z_6 + .05z_7 + .44z_p$
Face temp.	$z_c = z_x - .08z_3 + .02z_4 - .06z_5 - .08z_6 - .06z_7 + .17z_p$
Axillary temp.	$z_c = z_x + .01z_3 + .02z_4 - .19z_5 + .05z_6 - .02z_7 + .04z_p$
Finger pulse volume	$z_c = z_x + .08z_2 + .09z_3 + .04z_4 - .01z_5 - 01z_6 + .11z_7 + .59z_p$
Stomach period	$z_c = z_x + .12z_1 - .14z_2 - .03z_3 - .12z_4 - .02z_5 + .04z_6 + .11z_7 + .40z_p$

z_c= corrected standard score
z_x= uncorrected standard score
1= age
2= weight
3= time of testing
4= initial room temperature
5= external temperature at time of testing
6= lowest relative humidity in previous 24 hours
7= highest barometric pressure in previous 24 hours
p= pre-stimulus level

$z_i = (X_i - B_i)/\sigma_i$ where the values of B_i are the correction baseline values shown in Table 1-C, and the values of B_p are the baseline values shown in Table 1-F.

Table 1-F

MEANS AND STANDARD DEVIATIONS OF UNCORRECTED PRE-STIMULUS LEVELS AND ARBITRARY BASELINES UPON WHICH CORRECTIONS OF PHYSIOLOGICAL REACTIONS WERE BASED

Variable	Unit of Measurement	Mean	S.D.	Correction Baseline
Systolic blood pressure	mm. Hg.	104.3	9.1	105.0
Diastolic blood pressure	mm. Hg.	66.6	7.9	65.0
Pulse Pressure	mm. Hg.	37.8	10.3	40.0
Heart rate	cycles per minute	69.4	9.4	70.4
Respiration rate	cycles per minute	16.4	3.1	17.0
Palmar conductance	log micromhos	.735	.220	.700
Finger temperature	C.	30.93	3.84	32.00
Face temperature	C.	34.32	1.35	35.00
Axillary temperature	C.	35.88	.82	36.00
Finger pulse volume	log (microliters x100)	2.060	.240	2.000
Stomach period	seconds per cycle	20.94	2.09	20.00

Table 1-G

MEANS AND STANDARD DEVIATIONS OF CORRECTED
PRE-STIMULUS PHYSIOLOGICAL MEASURES

	Unit of measurement	Mean	S.D.
Salivary output	sq. root cc.	1.60	.48
Sublingual temperature	log (102.0-F.)	.555	.060
Palmar conductance	log micromhos	.978	.254
Volar conductance	log micromhos	.848	.164
Log conductance change	log micromhos	.420	.238
Systolic blood pressure	mm. Hg.	100.7	8.2
Diastolic blood pressure	mm. Hg.	65.0	6.8
Pulse pressure	mm. Hg.	35.8	9.0
Heart period	milliminutes per 10 cycles	147.4	18.9
Respiration period	log seconds per cycle	.576	.079
Pupil diameter	millimeters	4.61	1.14
Dermographia persistence	log minutes	.475	.302
Dermographia latency	seconds	15.6	4.9
Face temperature	C.	33.67	1.13
Axillary temperature	C.	35.76	.77
Finger temperature (1)	log (40.0 - C.)	.989	.190
Finger temperature (2)	log (40.0 - C.)	.952	.184
Finger pulse volume	log (microliters x 100)	2.062	.223
Stomach period	seconds per cycle	21.18	2.19

Table 1-H

MEANS AND STANDARD DEVIATIONS OF CORRECTED PHYSIOLOGICAL REACTIONS TO COLD PRESSOR STIMULATION

	Unit of measurement	Mean	S.D.
Systolic blood pressure	mm. Hg.	6.3	6.3
Diastolic blood pressure	mm. Hg.	6.1	7.3
Pulse pressure	mm. Hg.	-1.9	6.8
Heart rate	cycles per minute	14.6	8.5
Respiration rate	cycles per minute	3.8	3.2
Palmar conductance	log micromhos	.193	.178
Finger temperature	C.	-.65	.44
Face temperature	C.	-.004	.214
Axillary temperature	C.	.004	.103
Finger pulse volume	log (microliters x 100)	-.204	.109
Stomach period	seconds per cycle	-1.22	1.38

(Wenger, 1948). Another study describes a similar factor for male college students and custodians (Wenger, 1962-b). In that study, and in the present one, reactions to cold pressor stimulation also were analyzed to determine whether or not separate factors exist for autonomic reactivity.

The intercorrelations among the corrected pre-stimulus data for 245 female subjects are presented in Table 1-I. The coefficients are perhaps the lowest yet reported for such data, but low coefficients do not preclude the existence of factors. They do indicate a higher degree of unique variance among these variables for these subjects than has been found in previous studies.

That common factor variance does exist among these data may be seen in Table 1-J which shows the centroid solutions and the visually rotated solutions. As in previous work in this area, no attempt has been made to achieve simple structure, or positive manifold. Instead, following a suggestion made by Thurstone to one of the investigators (Wenger), rotations have sought to maximize the predicted autonomic factor.

The present results are less definitive than in previous analyses of young adult males (Wenger, 1948). Although Factor II corresponds fairly well to previously described general autonomic factors, Factors III and IV are not interpretable, and Factor I appears to be a separate skin conductance factor. Graphic plots of the rotated solution suggested that Factor III might be more clearly defined if it were rotated obliquely toward Factor II. Factor III', which was

Table 1-I

INTERCORRELATIONS AMONG PRE-STIMULUS PHYSIOLOGICAL MEASURES

Variables		1	2	3	4	5	6	7	8	9	10
Salivary Output	1										
Sublingual Temperature*	2	06									
Palmar Conductance*	3	02	09								
Volar Conductance*	4	10	07	19							
Log Conductance Change	5	00	-01	-26	01						
Heart Period	6	-08	22	18	08	-03					
Second Finger Temperature	7	01	-02	-01	07	-04	11				
Respiration Period	8	05	04	00	-02	03	00	00			
Pupillary Diameter*	9	08	00	07	02	06	08	-09	-11		
Dermographia Persistence	10	09	-01	08	04	00	-09	-05	-03	03	
Systolic Blood Pressure*	11	03	06	16	00	-05	23	01	03	-04	01

* Indicates reflection of variable
Max. N = 245 females

Table 1-J

THE FACTOR SOLUTIONS OF PRE-STIMULUS PHYSIOLOGICAL MEASURES

Variables		Centroid Solution					Rotated Solution				
		I	II	III	IV	h^2	I	II	III	IV	III'
Salivary Output	1	14	-15	27	13	13	-02	13	32	08	34
Sublingual Temperature*	2	26	19	10	12	13	-06	36	00	-01	20
Palmar Conductance*	3	52	-17	-21	-20	39	56	28	-04	01	12
Volar Conductance*	4	31	-08	23	-10	16	18	25	25	-08	35
Log Conductance Change	5	-24	08	17	29	18	-40	-05	07	13	03
Heart Period	6	40	42	-19	10	37	00	50	-35	-06	-02
Second Finger Temp.	7	-07	-13	-08	17	06	-02	-08	-01	23	-05
Respiration	8	-07	14	14	-08	05	-13	00	04	-19	03
Pupillary Diameter*	9	12	-18	-13	32	16	-03	08	-02	39	03
Dermographia Persist.	10	09	-25	08	11	09	10	02	20	20	18
Systolic Blood Pressure*	11	28	22	-11	06	15	04	33	-19	-01	02

* Indicates reflection of variable
Max. N = 245 females

the result of a 34° rotation, provided no better basis for interpretation than did the orthogonal Factor III.

Additional analyses of these data are being conducted. As previously stated, this is the first such study of physiological data in adult female subjects. Phase of menstrual cycle is known to be important in such measurements. Although attempts were made to control for this influence, they were not uniformly successful. Only further work can determine the reliability and validity of the obtained factors. For our present purposes, however, regression equations have been derived for estimating all five factors. The equations are shown in Table 1-K. The estimates for all factors are utilized in the next section.

One comment should be added. We believe that Factor II represents a general factor of ANS function. As evidence for this belief we call attention not only to the constellation of rotated Factor II but to the following fact. The regression equation for estimating the autonomic factor for young male adults (Wenger, 1948) was applied to the data of the present study. The correlation between these estimates, and the estimates of Factor II of the present study, was .75. Such a result is hardly a chance statistic.

A factor analysis of reactivity to cold pressor stimulation also was conducted. The intercorrelations among the variables appear in Table 1-L, which includes the major uncontrolled variables against which corrections were made. The latter were included for two purposes: to test the correction

Table 1-K

EQUATIONS FOR ESTIMATION OF FACTORS FROM PRE-STIMULUS PHYSIOLOGICAL DATA

Factor I = $-.47z_3-.09z_4-.27z_5-.12z_8$

Factor II = $.12z_1+.24z_2+.12z_3+.17z_4+.37z_6+.20z_{11}$

Factor III = $.26z_1+.24z_4-.30z_6+.14z_{10}-.13z_{11}$

Factor IV = $-.12z_4+.28z_7-.14z_8-.39z_9+.20z_{10}$

Factor III'= $.29z_1+.16z_2+.30z_4+.14z_{10}$

1 = Salivary output

2 = Sublingual temperature*

3 = Palmar conductance*

4 = Volar conductance*

5 = Log conductance change

6 = Heart period

7 = Second finger temperature

8 = Respiration period

9 = Pupil diameter*

10 = Dermagraphia persistence

11 = Systolic blood pressure

* Indicates reflection of variable

$z_i = (X_i-X_i) / \sigma_i$

Table 1-L

INTERCORRELATIONS AMONG PHYSIOLOGICAL REACTIONS TO COLD PRESSOR STIMULATION AND SELECTED UNCONTROLLED VARIABLES

		1	2	3	4	5	6	7	8	9	10	11	12	13
Systolic blood pressure	1													
Heart rate	2	37												
Respiration rate	3	08	35											
Palmar conductance	4	05	-03	-12										
Face temperature	5	11	22	02	09									
Axillary temperature	6	-09	-13	-08	-05	00								
Finger pulse volume*	7	07	03	-05	06	00	11							
Stomach period*	8	-03	06	03	-01	-07	06	09						
Finger temperature*	9	04	00	-02	-05	06	-03	05	-03					
Time of day	10	00	00	00	01	00	00	01	01	-02				
Room temperature	11	00	00	00	01	00	01	-02	-06	-01	26			
External temperature	12	00	-01	00	00	00	00	-01	-02	-01	15	07		
Relative humidity	13	00	00	00	00	00	00	01	00	00	06	-37	-28	
Barometric pressure	14	00	00	00	00	00	00	-01	-02	-01	05	53	-05	-57

* Indicates reflection of variable
Maximum N = 245 females

equations, and to define one or more hypothetical orthogonal factors. The centroid solution and a rotated solution obtained by Kaiser's Varimax method (1959) appear in Table 1-M.

Wenger (1962 b) has recently conducted another factor analysis for similar reactivity data from a male sample. That, and the present analysis, constitute the first extensive factorial investigations of physiological reactivity to any stimulus. For resting (pre-stimulus) data there exists a theoretical framework from which to predict a general factor of autonomic function (Wenger, 1948). No comparable theoretical basis exists for predicting a factor or factors for cold pressor reactivity data. For this reason we have deferred further study of the reactivity factors.

5. Relationships Among Ratings of Student Teacher Performance and the Physiological and Psychological Variables

The next step in the analysis of results was to correlate the physiological and psychological data against the criterion variables - the Classroom Observation Record (COR) and the University of California Rating Scale for Student Teaching (UR). The COR indices (described in Section 2 and Appendix C) provide four discrete scores. These scores involve: independent ratings by the supervisors (Sup.) and by the outside observers (Obs.) of teacher behavior (TB), and pupil behavior (PB). The combinations of TB and PB provide the total rating (TR); and the means of the Sup. and Obs. ratings provide a mean score (M) for each rating category. Thus a total of nine scores were obtained from the COR. The means and standard deviations

Table 1-M

THE FACTOR SOLUTIONS OF PHYSIOLOGICAL REACTIONS TO COLD PRESSOR STIMULATION

		Centroid Solution							Varimax Rotated Solution					
		I	II	III	IV	V	VI	h^2	I	II	III	IV	V	VI
Systolic blood pressure	1	26	38	22	09	-11	14	30	00	55	00	02	-01	-02
Heart rate	2	40	57	16	-10	06	15	55	-01	67	06	-30	01	-02
Respiration rate	3	29	34	-13	-25	26	-04	35	00	23	00	-54	02	00
Palmar conductance	4	-05	-04	19	18	-18	11	12	00	11	02	32	00	00
Face temperature	5	17	17	13	16	-11	08	12	01	32	-08	10	02	03
Axillary temperature	6	-16	11	12	-14	05	11	09	01	-11	26	05	00	-03
Finger pulse volume*	7	-09	03	22	-05	03	17	09	00	10	24	13	-02	-04
Stomach period*	8	-09	06	10	-19	09	16	-09	-02	03	29	-07	-03	-01
Finger temperature*	9	04	09	-04	05	-15	-10	05	00	08	-16	02	-09	-07
Time of day	10	18	-14	19	22	38	-07	29	02	02	-01	-01	53	06
Room temperature	11	52	-45	29	-07	11	-17	60	63	00	-05	00	45	01
External temperature	12	21	-17	-23	19	12	36	31	02	01	-03	00	09	54
Relative humidity	13	-50	42	11	25	26	-31	66	-67	-02	-03	00	16	-43
Barometric pressure	14	49	-40	20	-37	-28	-17	68	82	00	-03	00	00	-11

for all criterion variables and comparable data for the psychological measures appear in Table 1-N. It will be noted that data for the Cooperative English Test and the Arithmetic Concepts Test are not shown. Correlations were obtained for these two tests against all criterion variables, but were not used in further analyses of the data, since all coefficients were below .10.

The intercorrelations for the nine COR scores, and for the University Rating (UR) are presented in Table 1-O. It should be noted that the N varies for different categories in this and subsequent tables. The maximum N available (217) is for the ratings of the supervisors. The mean total rating (TR_m) also involved 217 subjects but, since the outside observers obtained ratings for only 187 of these subjects, the data for 30 subjects represent not true means but Sup. ratings alone. Inspection of the data in the table will demonstrate that although the ratings by the supervisors and outside observers did not correlate highly for any of the three categories, the mean score for each category showed such high relationships to both supervisor and outside observer that the use of their separate contributions alone should contribute little. Moreover, since the total mean rating correlated .99 and .86 respectively with the means for sub-categories TB and PB, it seemed obvious that among the nine COR scales it (TR_m), should receive greatest consideration. The last row of the table, however, indicates that the University Rating (UR) should receive separate consideration. The highest correlation it shows with any of the COR indices is .73, and it relates only .65 to TR_m.

Table 1-N

MEANS AND STANDARD DEVIATIONS OF CRITERION VARIABLES AND PSYCHOLOGICAL MEASURES

	Mean	S.D.
Teacher behavior (Sup.)	5.4	1.12
Teacher behavior (Obs.)	5.0	.87
Teacher behavior (Mean)	5.2	.86
Pupil behavior (Sup.)	5.2	1.28
Pupil behavior (Obs.)	4.9	.98
Pupil behavior (Mean)	5.0	1.05
Total rating (Sup.)	5.3	1.09
Total rating (Obs.)	5.0	.86
Total rating (Mean)	5.1	.92
University rating	4.2	.58
Muscle tension (Sup.)	4.8	1.92
Muscle tension (Obs.)	4.9	1.51
Muscle tension (Mean)	4.9	1.42
G.-Z. scale G	17.7	5.4
G.-Z. scale R	19.3	4.2
G.-Z. scale A	17.7	5.2
G.-Z. scale S	23.8	4.2
G.-Z. scale E	22.1	4.2
G.-Z. scale O	21.6	4.2
G.-Z. scale F	20.6	4.7
G.-Z. scale T	18.8	4.7
G.-Z. scale P	22.8	4.6
G.-Z. scale M	13.1	4.1
G.-Z. question marks	17.1	20.1

Table 1-O

INTERCORRELATIONS AMONG CRITERION VARIABLES

COR	TB_s	TB_o	TB_m	PB_s	PB_o	PB_m	TR_s	TR_o	TR_m
Teacher behavior (Sup.)									
Teacher behavior (Obs.)	40								
Teacher behavior (Mean)	90	81							
Pupul behavior (Sup.)	71	32	67						
Pupil behavior (Obs.)	35	81	67	38					
Pupil behavior (Mean)	68	66	78	90	80				
Total rating (Sup.)	99	41	90	81	38	76			
Total rating (Obs.)	40	99	80	35	88	72	41		
Total rating (Mean)	88	81	99	74	73	86	90	82	
University Rating (UR)	71	35	63	65	35	60	73	36	65

* In this and in tables I-P and I-Q the maximum N's are 169 for UR, 187 for Obs., and 217 for Sup. and Mean.

In spite of the foregoing indications it was decided to compute correlations for the physiological and psychological measures against all of the criterion variables. Such a procedure furnished a check for the assumptions previously stated. The correlation coefficients appear in Tables 1-P, 1-Q, and 1-R.

In Table 1-P which concerns the pre-stimulus physiological measures and the factor estimates, 18 significant relationships appear. It is of interest that the greatest number of significant coefficients occurred in columns TB_o, PB_o, and TR_o. This finding caused us to question the earlier decision to give greatest weight to criterion variables TR_m and UR, and led to a separate consideration of criterion TR_o, which correlated .99 and .88 with TB_o and PB_o respectively.

In Table 1-Q there also are few significant correlations, and no criterion except UR shows more than one. Only increases in respiration rate and decreases in finger temperature yielded three or more significant relationships with the criterion variables.

Table 1-R shows more significant coefficients. Considering first the scores from the G-Z Survey, there are two significant relationships with each Sup. rating (TB_s, PB_s, and TR_s) but only two G-Z scales were involved - scales S and O. Only scale S (Sociability) shows general relationship to the ten criterion variables, and eight of the coefficients, including those for the two composites (TR_m and UR), attained statistical significance.

Table 1-P

CORRELATIONS OF CRITERION VARIABLES WITH PRE-STIMULUS PHYSIOLOGICAL MEASURES AND FACTOR ESTIMATES

	TB_s	TB_o	TB_m	PB_s	PB_o	PB_m	TR_s	TR_o	TR_m	UR
Salivary output	-10	-14	-12	-06	-12	-11	-09	-13	-12	-04
Sublingual temperature	00	01	04	-06	-06	-03	-01	00	03	-13
Palmar conductance	-05	04	-03	04	10	06	-04	05	-01	05
Volar conductance	-02	02	-02	05	10	08	-01	03	-01	-02
Log conductance change	-08	07	-02	-03	06	01	-07	07	-01	-04
Systolic blood pressure	08	01	06	00	02	01	07	01	05	00
Diastolic blood pressure	06	-03	02	06	05	07	07	-01	04	05
Pulse pressure	03	02	04	-04	-02	-04	01	01	02	-03
Heart period	-04	-02	-05	-04	-07	-06	-04	-03	-06	06
Respiration period	02	-14	-05	00	-14	-06	02	-15*	-05	06
Pupil diameter	-01	-15*	-08	-02	-09	-07	-02	-14	-09	05
Dermographia persistence	-10	01	-05	-07	-05	-06	-10	00	-04	-14
Dermographia latency	08	-02	05	10	06	09	09	00	06	-03
Face temperature	-02	00	-04	-01	02	-03	-03	00	-05	-03
Axillary temperature	-10	-17*	-17*	-05	-14	-12	-11	-17	-18*	-03
Finger temperature (1)	-02	-14	-07	-04	-20*	-12	-02	-15*	-09	-11
Finger temperature (2)	-12	-17*	-18*	-13	-19*	-19*	-13	-17*	-19*	-10
Finger pulse volume	03	07	07	05	04	04	04	06	06	09
Stomach period	18*	02	08	05	09	03	16*	03	07	05
Factor I	07	-03	05	-03	-09	-05	06	-05	02	-02
Factor II	-05	-04	-05	-08	-13	-10	-05	-06	-06	-03
Factor III	-03	-05	-01	-04	-07	-06	-03	-05	-02	-08
Factor IV	-11	09	-03	-08	02	-04	-10	08	-03	-14
Factor III'	-08	-09	-07	-11	-17*	-15*	-08	-11	-08	-09

* Significant at .05 level or beyond

Table 1-Q

CORRELATIONS OF CRITERION VARIABLES WITH PHYSIOLOGICAL REACTIONS TO COLD PRESSOR STIMULATION

	TB_s	TB_o	TB_m	PB_s	PB_o	PB_m	TR_s	TR_o	TR_m	UR
Systolic blood pressure	-06	-03	-05	-09	-06	-09	-08	-03	-06	-15*
Diastolic blood pressure	00	00	01	-04	06	-01	00	01	01	-05
Pulse pressure	-03	05	-01	-01	-04	-03	-04	04	-02	-08
Heart rate	-07	-09	-06	-04	-03	-03	-07	-07	-05	-18*
Respiration rate	-10	-08	-11	-15*	-11	-16*	-12	-08	-13	-18*
Palmar conductance	05	01	05	08	04	10	06	01	06	-05
Face temperature	-02	11	06	-03	06	03	-01	10	06	03
Axillary temperature	13	06	12	09	-02	09	13	04	12	15
Finger temperature	15*	08	14*	10	01	09	15*	07	14*	03
Finger pulse volume	-03	00	00	-02	00	00	-03	00	-01	-08
Stomach period	11	-04	09	-04	-19	-11	08	-07	06	-02

* Significant at .05 level or beyond

Table 1-R

CORRELATIONS OF CRITERION VARIABLES WITH GUILFORD-ZIMMERMAN SCORES AND MUSCLE TENSION RATINGS

	TB_s	TB_o	TB_m	PB_s	PB_o	PB_m	TR_s	TR_o	TR_m	UR
G.-Z. scale G	06	00	08	11	02	12	08	00	09	08
G.-Z scale R	10	13	10	03	17*	07	09	14	09	03
G.-Z scale A	05	11	10	13	03	12	07	11	10	12
G.-Z scale S	27*	14	26*	27*	11	25*	29*	15*	27*	33*
G.-Z. scale E	-01	05	-01	04	06	03	-00	06	-00	01
G.-Z. scale O	15*	05	10	19*	01	12	16*	05	11	15
G.-Z. scale F	04	00	00	01	-03	-03	04	-01	-01	-07
G.-Z. scale T	02	-04	-00	-05	00	-05	01	-03	-01	-13
G.-Z. scale P	10	08	06	02	-03	-01	09	07	05	00
G.-Z. scale M	-02	13	00	07	11	06	00	13	02	01
G.-Z. question marks	01	-02	-04	01	-09	-07	02	-09	-05	00
Muscle tension (Sup.)	-10	00	-09	-18*	-01	-13	-13	00	-10	-16
Muscle tension (Obs.)	-15*	-30*	-23*	-13	-30*	-23*	-15*	-31*	-25*	-11
Muscle tension (Mean)	-26*	-19*	-28*	-27*	-23*	-28*	-28*	-20*	-30*	-27*

* Significant at.05 level or beyond

Maximum N for G-Z scales = 201
Maximum N for muscle tension (Sup.) and (Mean) = 136
Maximum N for muscle tension (Obs.) = 193

The outside observers contributed the major proportion of the significant relationships obtaining between ratings of muscle tension (MT) and the criterion variables. Although this raises the question of halo effect, the consistent significant relationships found here at least suggest that more objective measures of muscular tension might contribute significantly to the prediction of teacher performance in the classroom.

The Prediction of Student Teacher Performance

Although an analysis of data for drop-outs against those for continuing students was planned, the sample provided only 10 drop-outs. Of this group physiological data for four had been excluded from the analysis because of respiratory infections, medication, or high sublingual temperature. The remaining drop-out N of 6 was considered too small for analysis.

This study, therefore, provides little data for determining the value of the tests in the prediction of emotional stability or instability associated with teaching. It does provide preliminary information concerning the value of the tests in the prediction of student teacher performance. The basic data are the correlation coefficients against the two major criterion variables TR_m and UR which have been presented in Tables 1-P, 1-Q, and 1-R. Although the correlation coefficients are low, it must be remembered that the intercorrelations among the physiological variables are also low. Their magnitude, therefore, does not preclude their use in the prediction of teacher performance. To this end selected multiple correlations were computed and regression equations obtained. They appear in Table 1-S.

Table 1-S

MULTIPLE CORRELATION COEFFICIENTS AND BETA WEIGHTS FOR PREDICTING MAJOR CRITERION VARIABLES FROM SELECTED PHYSIOLOGICAL AND PSYCHOLOGICAL VARIABLES

Variables	Beta Weights TR_m	TR_m	UR	UR	TR_o
Salivary output	-.11	-.12			-.11
Finger temperature (2)	-.15	-.15	-.05	-.08	-.15
Axillary temperature	-.17	-.18			-.14
Sublingual temperature			-.08	-.06	
Dermographia persistence			-.11	-.15	
Respiration Period					-.13
Pupillary Diameter					-.16
Muscle tension mean	-.18	-.20	-.17	-.22	-.16
G-Z Scale S	.32	.31	.30	.28	.13
Systolic blood pressure reaction			-.11		
Heart rate reaction			-.08		
Respiration rate reaction	-.13		-.12		
Axillary temperature reaction	.03		.07		
Finger temperature reaction	.12				
Multiple r	.51	.48	.50	.43	.40

Theoretically, the use of all variables that correlate with a criterion variable should provide the largest multiple correlation. In practice, those with coefficients less than .10 contribute little except more complex equations. For our present purposes, then, we employed only those physiological and psychological variables that correlated .10 or higher with criterion variables TR_m and UR. The resulting multiple r's appear at the bottom of the first and third columns of Table 1-S, and are seen to be .51 and .50 respectively.

It is not surprising that the test battery cannot be employed successfully in predicting student teacher performance for individuals. It is clear, however, that it can be used for group predictions. Of more significance is the inference that some of the tests will supplement the COR and UR evaluations for the prediction of in-service teacher performance. None of the present tests alone correlated more than .33 with UR nor more than .30 with TR_m, yet, as a group, they can predict either UR or TR_m almost as well as either can be predicted from the other.

A multiple correlation of the test battery with TR_o also was obtained because, as was pointed out in the introduction to this section, it seemed possible that TR_o showed closer relationships to some of the tests than did TR_m or UR. It showed no significant relationships, however, to the measures of physiological reactivity so the obtained multiple r of .40 was based only upon the pre-stimulus physiological measures, the G-Z scale, and the mean muscle tension rating. Similar

variables were utilized in other multiple correlations against TR_m and UR. They are shown at the bottom of columns two and four of Table 1-S. Although the reduced equations provide reduced predictive capacity, it is of interest that the reduction is least for the criterion we regard as "best" (TR_m); the multiple r for only five variables was .48.

6. Discussion and Conclusions

This study has sought to test the following hypotheses:

(A) Individual differences in autonomic response patterns furnish a basis for the prediction of those individuals who cannot withstand well the stress of teaching and those who may develop specific psychosomatic and other psychological disorders.

(B) Measures of autonomic functions will improve the predictive value of psychological correlates of teacher performance.

There is reason to believe that the results afford some support for the second hypotheses. Since so few subjects dropped out of student teaching this study can afford no test of the first hypotheses until extended follow-up studies now under way are completed.

There are two major contributions of the study. First, a pool of data which we believe worthy of validation against in-service teacher performance has been collected. Second, the investigation of autonomically innervated functions in young adult females provides a new body of information which will have many applications.

In the present study 279 subjects were tested between October 27, 1959, and August 17, 1960. The only criterion variables available at this time are evaluations of supervised student teaching - variables that we believe should be regarded as potential predictors, not validation criteria.

For these 279 subjects, adequate physiological data were obtained for 247, and adequate psychological data and evaluations of student teacher performance were obtained for somewhat smaller numbers. Funds have been made available for follow-up evaluations of these subjects during their in-service teaching. Only as stresses accumulate and attrition occurs will it be possible to test the hypotheses which induced this study. Only later, then, can the value of this study for education be assessed.

Immediate values are present, however, for basic science. The contributions may be summarized as follows:

(A) Normative data on autonomic functions in adult females This study constitutes the first extensive investigation of autonomically innervated functions in an adult female population. The means and standard deviations provide a body of data which can be employed by other investigators for comparative purposes in psychophysiological research. As one illustration of the value of such normative data, it may be pointed out that comparable data for adult males (Wenger, 1948) have now been employed in over a score of comparative investigations, and have served to stimulate much research. There is every reason to believe that the physiological data of the present study will serve similar ends.

(B) Transformations and corrections of physiological data

This study has provided the largest sample yet available for investigating the need for transformations and corrections of continuously recorded physiological data. As reported in Section 3, it proved necessary to transform the distributions for some variables, and to correct every variable for the effects of one or more uncontrolled variables. Such findings will sadden many investigators, but they cannot go unheeded. They suggest that a series of similar investigations should be initiated in many laboratories to determine what transformations and corrections are needed for particular samples in particular situations. The results point up the need for caution in the evaluation of studies that have neglected these considerations.

(C) The factorial analyses

This study also has pioneered in the factorial investigation of physiological measurements in female adults. Although some of the obtained factors are not readily identifiable, a general factor of autonomic function has been described, and an equation presented for its estimation. A new research tool is thereby provided. It may be expected to stimulate further research with female subjects.

Three other contributions should be mentioned. Although the investigators do not regard the so-called "criterion variables" of this pilot study as adequate criteria of teaching performance, they probably are related to it. This study then permits the following conclusions:

(1) Scores on the Guilford-Zimmerman Scale S are positively related to teaching performance;

(2) Characteristic level of muscular tension is negatively related to teaching performance;

(3) Finger temperature is positively related to teaching performance; other physiological measurements also may be related.

These conclusions are derived from the statistics presented in Table 1-S and from the intercorrelations shown in Table 1-O among the University Ratings (UR), and the total mean Classroom Observation Ratings (TR_m), and the total COR of the outside observers (TR_o). Although TR_m and UR correlate .65, much of the covariance may be attributed to the fact that the supervisors were solely responsible for UR and contributed to TR_m. Thus a better index of true common variance between the two kinds of evaluations is obtained from the correlation of .36 between UR and TR_o. When different raters use different instrum nts yet obtain evaluations that tend to covary, it seems reasonable to assume that this common variance is related to teaching performance and that other variables which are related to both UR and TR_o also are related to teaching performance.

Three variables are seen in Table 1-S to satisfy this criterion. One, the mean muscle tension rating, may be seen in Table 1-R to have demonstrated significant correlations with all criterion variables, while the other two - G-Z Scale S and the second measure of finger temperature (see Tables 1-R and 1-P) show the next greatest number of significant relationships.

The Guilford-Zimmerman Scale S scores represent self-evaluations of the trait of social participation or sociability. The results suggest that those who so rate themselves high on this

scale also appear to be more sociable to observers, and that such a trait enters into ratings of teaching behavior. Such a possible halo effect, however, does not minimize the significance of this scale as one measure in a test battery for the prediction of teacher behavior.

More certainly suspect for halo effect are the ratings of muscle tension which, for the outside observers at least, were based on the same observation periods that made possible the TR_o ratings. The general relationship of the mean tension ratings to <u>all</u> criterion variables suggests, however, that this variable deserves further study.***

The third variable, finger temperature, has a less clearly defined relationship to supervisors' ratings than it has to those of the outside observers, but again it seems worthy of further study.

*** One step in this direction has already been taken. As a result of the relationships found between muscle tension and teacher performance, Iris Balshan, a research assistant on this project, conducted her doctoral dissertation in such a manner as to provide a test of this possible relationship which would be free of halo effect. (Iris Dale Balshan, "Muscle Tension and Personality in Women: A Factorial Study." <u>Archives of General Psychiatry</u> December 1962, Vol. 7, pp. 436-448). Her investigation tested the hypothesis that a general factor of muscular tension exists in young adult females, with muscle tension being measured in terms of action potentials from sixteen muscle groups. Miss Balshan selected her subjects from elementary teacher candidates. Her results were positive and provided a regression equation in terms of which a general muscle tension factor was estimated for each subject.

Concerning the other physiological variables which appear in Table S, it can only be said that they have some value for predicting TR_o, TR_m, or UR, and should not be neglected in further studies on prediction of teacher performance.

Regardless of the possible contributions of other variables, it may be of interest to point out that the three variables mentioned in the foregoing paragraphs may be used with some success in the prediction of student teaching performance. Their multiple correlations with the three criteria considered in Table 1-S are shown in the following tabulation:

	TR_m	TR_o	UR
G-Z Scale S Mean muscle tension Finger temperature	.40	.27	.40

Although the multiple correlations are not quite as high as those shown in Table 1-S they do permit one to characterize groups of good student teachers as relaxed, sociable, and possessing high finger temperature. Such a picture is not unreasonable. Perhaps it will obtain also for good in-service teachers. We venture to predict, however, that ability to withstand the daily and accumulative stress of in-service teaching will involve other variables that we have studied, and, in particular, estimates of the autonomic factor.

II. RE ANALYSIS OF THE PHYSIOLOGICAL TEST DATA

1. Reduction in Size of Sample

After completion of the first study, it was decided in subsequent work to reduce the sample size in order to eliminate race and phase of the menstrual cycle as sources of error variance in the physiological data. Accordingly, the sample employed in the follow-up studies included only those subjects whose ancestry was Caucasian and who had been given the physiological tests within a period of 5 to 16 days following cessation of menses. Elimination of subjects by these criteria reduced the sample N to 166. The preliminary treatment of the physiological measures, including transformation, correction and factor analysis, which had been employed in the first study, then was repeated for this smaller sample before further analyses of their relations to the data collected in the follow-up studies were undertaken. The procedure followed was the same as in the first study, except for some minor modifications suggested by the experience gained from this and other investigations. The statistics for the restricted sample comparable to those for the initial sample, which were presented in Tables 1-A to 1-J, are shown here in the correspondingly lettered Tables 2-A to 2-J.

2. Transformations and Corrections of the Physiological Data

Examination of the distributions of the physiological variables in the restricted sample of 166 subjects indicated that in general the transformations employed in the first study still served to normalize the distributions or at least to eliminate the high degree of skewness which originally was present in many of them. It was found that changing the numerical constant in the transformation of finger temperature from 40 to 39 and applying a similar logarithmic transformation to face and axillary temperatures, which had not been transformed in the first study, produced more nearly normal distributions for these variables. The same transformations were utilized in the measurement of the skin temperature reactions to cold pressor stimulation. In addition, a logarithmic transformation was applied to age in order to reduce the skewness of the distribution. For all other variables the units of measurement, as shown in Tables 2-C, 2-G and 2-H, were the same as in the first study.

Next, a re-analysis of the effects of uncontrolled variables on the physiological measures was performed. Correlations between the physiological variables and all of the uncontrolled variables investigated in the first study were obtained for the reduced N. These are shown in Tables 2-A.1, 2-A.2, 2-B.1 and 2-B.2. In the first study, some of the physiological variables had been corrected for age, weight and/or oxidant concentration; others had not been. In the

Table 2-A.1

CORRELATIONS OF PRE-STIMULUS PHYSIOLOGICAL MEASURES WITH THE SEVEN UNCONTROLLED VARIABLES FOR WHICH CORRECTIONS WERE APPLIED

	A	W	Ti	RT	T	H	P
Salivary output	-07	05	06	-03	00	-03	?
Sublingual temperature	08	06	-28	19	-17	-31	26
Palmar conductance	-14	-06	11	19	09	-24	16
Volar conductance	16	10	00	18	05	-09	16
Log conductance change	-03	14	-05	20	01	-23	15
Systolic blood pressure	-03	15	02	-14	09	12	-12
Diastolic blood pressure	03	11	-21	-16	-04	02	09
Pulse pressure	-02	07	05	-01	09	07	-16
Heart period	05	15	-15	-08	00	07	-05
Respiration period	04	09	-16	12	06	-21	24
Pupil diameter	-08	-04	-09	-16	-07	-01	-01
Dermographia persistence	-20	-02	-18	00	-10	-18	15
Dermographia latency	11	08	09	-04	11	-11	00
Face temperature	02	02	-29	-51	08	28	-40
Axillary temperature	-14	14	-22	-11	-10	05	-01
First finger temperature	-08	-21	-21	-10	-42	-14	18
Second finger temperature	-09	-18	-19	-43	-17	10	-12
Finger pulse volume	-02	10	05	07	30	15	-22
Stomach period	-13	08	-05	02	-24	13	02

A = age
W = weight
Ti = time of testing
RT = initial room temperature
T = external temperature at time of testing
H = lowest relative humidity in previous 24 hours
P = highest barometric pressure in previous 24 hours

Table 2-A.2

CORRELATIONS OF PRE-STIMULUS PHYSIOLOGICAL MEASURES WITH OTHER UNCONTROLLED VARIABLES

	Dcl	SR	Ox	CO	POx	NO_2	NO	Oz	SO_2
Salivary output	-01	00	-01	-08	-12	-06	-10	00	-03
Sublingual temp.	-29	-21	-10	16	23	-02	15	-10	17
Palmar cond.	-08	00	-11	03	07	13	10	00	11
Volar cond.	-16	-08	-09	13	10	00	18	-09	04
Log cond. change	-24	00	02	17	23	12	11	01	23
Systolic b. p.	15	05	22	-05	-05	12	-13	19	-04
Diastolic b. p.	-03	-12	09	-01	02	06	-10	05	-09
Pulse pressure	13	11	12	-03	-05	04	-02	12	04
Heart period	09	06	-06	-19	-13	-14	-13	-06	-11
Respiration period	-15	-07	07	22	26	16	18	02	-05
Pupil diameter	-01	-09	-13	02	-05	-11	03	-06	07
Derm. persist.	-09	09	03	05	10	02	05	-04	08
Derm. latency	14	07	-01	-08	-12	-06	-10	00	-03
Face temperature	45	27	13	-32	-34	-16	-28	06	-29
Axillary temp.	04	-04	-07	-17	-05	-03	-13	-07	05
1st Fing. temp.	-18	-19	-32	-01	-01	-12	18	-22	03
2nd. Fing. temp.	18	08	-09	-26	-21	-17	-02	-14	-15
Fing. pulse vol.	22	20	24	-04	05	07	-24	20	-06
Stomach period	-05	-26	-06	-11	-04	-07	-12	-09	06

Dcl= apparent declination of sun on test day.
SR = mean solar radiation on test day.
Ox = maximum oxidant concentration on test day.
CO = maximum carbon monoxide concentration on test day.
POx= maximum precursor oxidant concentration on test day.
NO_2= maximum nitrogen dioxide concentration on test day.
NO^2= maximum nitrogen oxide concentration on test day.
Oz = maximum ozone concentration on test day.
SO_2= maximum sulfur dioxide concentration on test day.

Table 2-B.1

CORRELATIONS OF PHYSIOLOGICAL REACTIONS TO COLD PRESSOR STIMULATION WITH THE SEVEN UNCONTROLLED VARIABLES FOR WHICH CORRECTIONS WERE APPLIED

	A	W	Ti	RT	T	H	P
Systolic blood pressure	16	-09	09	-10	06	-01	-02
Diastolic blood pressure	11	01	19	02	19	01	04
Pulse pressure	03	-07	-12	-07	-16	-05	-01
Heart rate	-05	-08	00	02	13	-17	12
Respiration rate	04	01	-16	02	-15	-06	07
Palmar conductance	-19	-07	08	18	11	-21	14
Finger temperature	-06	23	13	17	10	-02	08
Face temperature	-02	-15	-07	00	-05	-05	-02
Axillary temperature	09	04	-01	03	-27	08	04
Finger pulse volume	-11	-19	-14	-15	-19	-02	-04
Stomach period	-13	-02	-02	-01	-04	00	-05

A = age
W = weight
Ti= time of testing
RT= initial room temperature
T = external temperature at time of testing
H = lowest relative humidity in previous 24 hours
P = highest barometric pressure in previous 24 hours

Table 2-B.2

CORRELATIONS OF PHYSIOLOGICAL REACTIONS TO COLD PRESSOR STIMULATION WITH OTHER UNCONTROLLED VARIABLES

	Dcl	SR	Ox	CO	POx	NO_2	NO	Oz	SO_2
Systolic b. p.	-06	07	05	05	05	09	05	03	00
Diastolic b. p.	-03	12	11	-01	08	10	-04	09	03
Pulse pressure	-04	-10	-11	06	-04	-05	07	-04	-01
Heart rate	-09	16	11	10	10	24	18	12	12
Respiration rate	-12	-03	-08	09	-01	-06	06	-04	-02
Palmar cond.	-08	00	-08	-09	03	00	-05	-06	-02
Finger temp.	-08	00	09	12	06	06	00	05	11
Face temp.	-02	-05	-09	-01	-04	-03	01	-02	-02
Axillary temp.	-17	-27	-22	04	09	-05	12	-12	01
Fing. pulse vol.	00	-01	-07	-04	-12	-09	09	-11	07
Stomach period	-07	17	23	-12	17	07	21	-07	-22

Dcl= apparent declination of sun on test day.
SR = mean solar radiation on test day.
Ox = maximum oxidant concentration on test day.
CO = maximum carbon monoxide concentration on test day.
POx= maximum precursor oxidant concentration on test day.
NO_2= maximum nitrogen dioxide concentration on test day.
NO^2= maximum nitrogen oxide concentration on test day.
Oz = maximum ozone concentration on test day.
SO_2= maximum sulfur dioxide concentration on test day.

re-analysis all physiological variables, both pre-stimulus and reactivity measures, were corrected for the same set of seven uncontrolled variables: age, weight, time of day, room temperature, external temperature at time of testing, and lowest relative humidity and highest barometric pressure in the 24 hours preceding testing. Table 2-C shows the means, standard deviations and intercorrelations of these seven uncontrolled variables, and the arbitrary baseline values that were employed in the correction equations. No corrections were made for the apparent effects of other uncontrolled variables, since it appeared from a consideration of the partial and multiple correlations of each physiological variable with different combinations of uncontrolled variables that the correlations shown in Tables 2-A.2 and 2-B.2 could be accounted for by the covariation of these uncontrolled variables with temperature, pressure, and humidity.

The physiological reactions to cold pressor stimulation were corrected additionally for pre-stimulus baseline effects. The correlations of reactions with baseline levels are shown in Table 2-B.3. As would be predicted from the Law of Initial Value, the reaction for each variable was negatively correlated with the baseline level for that variable, the one exception being palmar conductance, which has been found in other studies (cf. Wilder, 1965) not to conform to the Law of Initial Value. Most of the reactions, furthermore, showed correlations with baseline levels in one or more other variables which were of sufficient magnitude to warrant consideration as a basis for additional correction of the reactions.

Table 2-B.3

CORRELATIONS OF PHYSIOLOGICAL REACTIONS TO COLD PRESSOR STIMULATION WITH PRE-STIMULUS BASELINE LEVELS

	Pre-stimulus Baseline Levels										
Reactions	SBP	DBP	PP	HR	RR	PC	FiT	FaT	AxT	FPV	SP
Systolic b. p.	-16	-02	-09	02	02	14	03	01	-10	-08	08
Diastolic b. p.	12	-30	31	-01	06	-02	-04	-09	-04	02	-07
Pulse pressure	-25	25	-40	04	-02	17	01	02	00	-06	05
Heart rate	04	-09	10	-19	-09	-07	02	-05	-04	09	-01
Respiration rate	03	-07	10	-04	-26	-07	-02	-08	-03	-04	-03
Palmar cond.	14	-01	12	-06	02	11	-09	-17	05	06	-02
Finger temp.	-15	-05	-11	00	02	-01	-64	-17	10	51	-08
Face temp.	-07	16	-17	19	-14	05	-06	-09	-08	01	-01
Axillary temp.	03	11	-05	15	16	06	11	-14	-02	-04	-04
Finger pulse vol.	-14	13	-23	-05	00	08	47	04	-17	-62	01
Stomach period	02	-03	04	05	-11	-09	-12	-21	-14	04	-40

Table 2-C

MEANS AND STANDARD DEVIATIONS, AND INTERCORRELATIONS OF THE SEVEN UNCONTROLLABLE VARIABLES, FOR WHICH CORRECTIONS WERE APPLIED

	Unit of measurement	Mean	S.D.	Correction Baseline*	Intercorrelations A	W	Ti	RT	T	H
Age (A)	log (years-18)	.598	.230	.600						
Weight (W)	Pounds	122.4	13.9	120.0	09					
Time of testing (Ti)	Hours	12.2	2.7	12.0	-11	-07				
Room temperature (RT)	C.	25.0	1.8	24.0	15	02	29			
External temperature (T)	F.	64.2	7.3	65.0	20	01	14	14		
Lowest relative humidity previous 24 hours (H)	Per cent	36.5	18.6	40.0	-04	-05	08	44	-20	
Highest pressure previous 24 hours (P)	Barometric inches	30.10	.14	30.05	11	-01	04	53	-02	-62

* The correction baseline is the arbitrary value used in place of the sample mean in the correction equations for the resting and reactivity physiological measures.

In most instances, therefore, the physiological reaction was corrected for the effect of pre-stimulus baseline level in one or more other physiological variables, as indicated in Table 2-E. In order to avoid inclusion of a large number of trivial corrections, however, corrections were made only for those additional physiological variables whose beta weights were .10 or greater in the multiple regression equation relating a physiological reaction to baseline levels and other uncontrolled variables.

The beta weights in the equations for correction of the pre-stimulus and reactivity measures are presented in Tables 2D and 2E respectively, and the means and standard deviations of the pre-stimulus baseline levels from which reactions to cold pressor were measured are shown in Table 2-F. Arbitrary "correction baseline" values for the uncontrolled variables were used in the correction equations in place of the sample means, and these values appear in Tables 2-C and 2-F. The means and standard deviations of the corrected physiological variables are presented in Tables 2-G and 2-H.

In order to make the results of the follow-up studies more easily interpretable when presented in tabular form, all of the physiological measures, muscle tension ratings, psychological test scores and indices of teaching performance were standardized with reference to the means and standard deviations for the sample of 166 subjects and converted to T scores having a mean of 50 and a standard deviation of 10. Certain of the pre-stimulus physiological measures were reflected so that higher T scores (above 50) consistently would

Table 2-D

BETA WEIGHTS IN THE EQUATIONS FOR CORRECTION OF

PRE-STIMULUS PHYSIOLOGICAL MEASURES

	A	W	Ti	RT	T	H	P
Salivary output	-.08	.07	.08	-.15	.04	.06	.24
Sublingual temperature	.05	.03	-.28	.18	-.21	-.24	.02
Palmar conductance	-.16	-.05	.07	.10	.06	-.20	-.01
Volar conductance	.14	.08	-.01	.14	-.09	.01	.08
Log conductance change	-.08	.13	-.09	.18	-.02	-.17	-.04
Systolic blood pressure	-.05	.16	.03	-.13	.13	.11	.03
Diastolic blood pressure	-.01	.12	-.17	-.22	.05	.14	.30
Pulse pressure	-.01	.07	.15	.03	.05	-.04	-.20
Heart period	.01	.14	-.15	-.02	.04	.11	.04
Respiration period	-.04	.08	-.19	.04	.09	-.02	.22
Pupil diameter	-.05	-.03	-.03	-.20	-.04	-.07	.06
Dermographia persistence	-.22	-.01	-.19	-.02	-.05	-.12	.12
Dermographia latency	.13	.06	.18	-.18	.04	-.23	-.06
Face temperature	.01	-.01	-.18	-.38	.14	.03	-.12
Axillary temperature	-.20	.24	-.26	.03	.02	.18	.09
First Finger temperature	.02	-.21	-.10	-.18	-.43	-.23	.12
Second Finger temperature	.01	-.17	-.04	-.48	.12	-.09	.07
Finger pulse volume	-.13	.19	-.06	.27	.32	.28	-.16
Stomach period	-.16	.11	-.14	.16	-.17	.20	.01

A = age
W = weight
Ti = time of testing
RT = initial room temperature
T = external temperature at time of testing
H = lowest relative humidity in previous 24 hours
P = highest barometric pressure in previous 24 hours

Correction equation: $z_c = z_x + B_1 z_1 + B_2 z_2 + \ldots + B_k z_k$

z_c = corrected standard score

z_x = uncorrected standard score

B_i = beta weight shown in table

$z_i = (X_i - C_i)/\sigma_i$ where the values of C_i are the correction baseline values shown in Table C.

Table 2-E

BETA WEIGHTS IN THE EQUATIONS FOR CORRECTION OF PHYSIOLOGICAL REACTIONS TO COLD PRESSOR STIMULATION

Variable	A	W	Ti	RT	T	H	P	Y_1	Y_2	Y_3	
Systolic b. p.	.25	-.07	.19	-.27	-.02	-.16	-.05	-.21	.17		(PC)
Diastolic b. p.	.11	-.01	.15	-.19	.14	.10	.25	-.20	.22		(PP)
Pulse pressure	.11	-.04	-.01	-.01	-.20	-.25	-.29	-.37	.22		(PC)
Heart rate	-.06	-.13	.03	-.11	.10	-.14	.13	-.23	.16		(RR)
Respiration rate	.05	-.03	-.11	.04	-.19	-.05	.01	-.23	.15		(PP)
Palmar cond.	-.21	-.10	-.01	.10	.08	-.16	-.01	.07	.17		(SBP)
Finger temp.	-.01	.13	.07	-.18	.03	.05	.10	-.66			
Face temp.	-.01	-.11	-.09	.01	-.02	-.12	-.19	-.13	-.22	.19	(PP&HR)
Axillary temp.	.13	.07	-.04	.05	-.27	.09	.07	-.01	.14	.16	(HR&RR)
Fing. pulse vol.	-.11	-.03	-.11	.09	.01	.02	-.15	-.56	.14		(FiT)
Stomach period	-.20	.02	-.14	-.01	-.08	.05	-.10	-.44	-.12	-.20	(FiT&FaT

A = age
W = weight
Ti = time of testing
RT = initial room temperature
T = external temperature at time of testing
H = lowest relative humidity in previous 24 hours
P = highest barometric pressure in previous 24 hours
Y_1 = pre-stimulus level for physiological variable
Y_2 & Y_3 = pre-stimulus levels for additional physiological variables in parentheses

Correction equation: $z_c = z_x + B_1 z_1 + B_2 z_z + ... + B_k z_k$

z_c = corrected standard score
z_x = uncorrected standard score
B_i = beta weight shown in table
$z_i = (X_i - C_i)/\sigma_i$ where the values of C_i are the correction baseline values shown in Tables C and F.

Table 2-F

MEANS AND STANDARD DEVIATIONS OF UNCORRECTED PRE-STIMULUS LEVELS, AND ARBITRARY BASELINES UPON WHICH CORRECTIONS OF PHYSIOLOGICAL REACTIONS WERE BASED

Variable	Unit of Measurement	Mean	S.D.	Correction Baseline
Systolic blood pressure	mm. Hg.	104.0	9.0	105.0
Diastolic blood pressure	mm. Hg.	66.7	7.4	65.0
Pulse pressure	mm. Hg.	37.4	10.0	40.0
Heart rate	cycles per minute	69.8	9.6	70.0
Respiration rate	cycles per minute	16.4	2.9	16.0
Palmar conductance	log micromhos	.765	.215	.700
Finger temp.	log (39.0-C.)	,929	.187	.900
Face temp.	log (39.0-C.)	.736	.097	.700
Axillary temp.	log (40.0-C.)	,596	.063	.600
Finger pulse volume	log (microliters x 100)	2.097	.232	2.100
Stomach period	seconds per cycle	20.94	2.12	21.00

Table 2-G

MEANS AND STANDARD DEVIATIONS OF CORRECTED PRE-STIMULUS PHYSIOLOGICAL MEASURES

	Unit of measurement	Mean	S.D.
Salivary output	sq. root cc.	1.58	.49
Sublingual temperature	log (102.0-F.)	.548	.055
Palmar conductance	log micromhos	1.000	.256
Volar conductance	log micromhos	.861	.156
Log conductance change	log micromhos	.390	.246
Systolic blood pressure	mm. Hg.	101.7	8.0
Diastolic blood pressure	mm. Hg.	65.3	6.6
Pulse pressure	mm. Hg.	35.9	8.5
Heart period	milliminutes per 10 cycles	144.6	18.8
Respiration period	log seconds per cycle	.564	.074
Pupil diameter	millimeters	4.72	1.05
Dermographia persistence	log minutes	.414	.306
Dermographia latency	seconds	16.2	5.0
Face temperature	log (39.0-C.)	.764	.081
Axillary temperature	log (40.0-C.)	.593	.058
First finger temperature	log (39.0-C.)	.940	.177
Second finger temperature	log (39.0-C.)	.968	.161
Finger pulse volume	log (microliters x 100)	2.090	.205
Stomach period	seconds per cycle	20.71	2.00

Table 2-H

MEANS AND STANDARD DEVIATIONS OF CORRECTED PHYSIOLOGICAL REACTIONS TO COLD PRESSOR STIMULATION

	Unit of measurement	Mean	S.D.
Systolic blood pressure	mm. Hg.	7.6	5.8
Diastolic blood pressure	mm. Hg.	7.4	7.5
Pulse pressure	mm. Hg.	-2.3	6.7
Heart rate	cycles per minute	16.4	8.7
Respiration rate	cycles per minute	4.2	3.2
Palmar conductance	log micromhos	.221	.195
Finger temperature	log (39.0-C.)	.031	.019
Face temperature	log (39.0-C.)	-.002	.017
Axillary temperature	log (40.0-C.)	-.001	.010
Finger pulse volume	log (microliters x 100)	-.244	.098
Stomach period	seconds per cycle	-1.20	1.12

indicate deviations from the normative mean in the direction of relative PNS dominance and lower T scores (below 50) would indicate deviations in the direction of relative SNS dominance. The variables that were reflected are marked with asterisks in the tables. In some instances transformation of a variable had the effect of reflection; to avoid confusion asterisks have been used to indicate reflection of variables with respect to their original units of measurement. The physiological reactions to cold pressor stimulation also were reflected whenever the mean reaction was a decrease from the pre-stimulus baseline level, so that higher T scores consistently would represent greater magnitudes of reaction regardless of direction. The reactivity measures marked with asterisks, therefore, are those in which the direction of response, in terms of the original units of measurement, was negative.

3. Factorial Analysis of the Corrected Physiological Variables

A second factor analysis of the corrected physiological measures was performed in order to obtain new estimates of a general autonomic factor. The variables employed were the same ones as in the first analysis, except for log conductance change, which was eliminated to prevent the appearance of the specific skin conductance factor found in the previous factor solution (cf. Table 1-J). The intercorrelations of the pre-stimulus measures are shown in Table 2-I. The coefficients, as in the previous analysis, generally were low. The increased homogeneity of the reduced sample did not appear to have affected the magnitudes by the correlations in any consistent way.

Table 2-I

INTERCORRELATIONS AMONG PRE-STIMULUS PHYSIOLOGICAL MEASURES

Variables		1	2	3	4	5	6	7	8	9
Salivary output	1									
Sublingual temperature*	2	10								
Palmar conductance*	3	-02	13							
Volar conductance*	4	04	05	11						
Heart period	5	-13	23	18	07					
Second finger temp.	6	-04	03	09	-05	-03				
Respiration period	7	-01	17	-02	-10	-01	01			
Pupillary diameter*	8	08	10	08	08	16	04	-19		
Dermographia Persist.	9	13	-07	11	02	-10	-01	-04	02	
Systolic Blood Pressure*	10	03	04	13	-01	27	09	-09	-03	01

* indicates reflection of variable
Max. N = 166 females

As may be seen from a comparison of Tables 1-I and 2-I, some were slightly increased, others slightly reduced. It was expected, therefore, that the new factor solution would not differ greatly from the previous one.

The centroid factor solution of the correlation matrix is shown in Table 2-J.1, and a computer programmed Varimax (Kaiser, 1959) rotated solution is shown in Table 2-J.2. The six factors yielded by the Varimax method are not readily interpretable, and none of them resembles the general factor found in the first analysis. Factor I may be a circulatory system factor, and Factor VI possibly represents a factor related in some way to the skin; but the physiological significance of the other factors is not at all clear. Inspection of the rotated solution suggested that further rotation might produce a general factor, and after several additional rotations Factor IA was obtained. This factor corresponds fairly well with Factor II in the first analysis (cf. Table 1-J) and with the general autonomic factors reported in previous studies (Wenger, 1948; Wenger, 1962 b). It differs from the previously obtained general factors mainly in the absence of salivary output from the factor pattern. We believe that Factor IA represents a general factor of ANS function for adult females comparable to the factor which has been employed in numerous studies of adult males (cf. Wenger, 1966). Since the correlation of salivery output with heart period, the variable with the highest loading on Factor IA and on the general factor for males, was negative in the present sample, we are inclined to think that Factor IA probably is a more valid index of general ANS function than is the corresponding Factor II from the first analysis of the female data.

Table 2-J.1

CENTROID FACTOR SOLUTION FOR PRE-STIMULUS

PHYSIOLOGICAL MEASURES

	Factors						
Variables	I	II	III	IV	V	VI	h^2
Salivary output	13	26	25	15	-19	19	24
Sublingual temperature*	27	-26	23	26	20	19	34
Palmar conductance*	41	-13	13	-17	05	-22	28
Volar conductance*	21	13	07	-11	20	04	12
Heart period	37	-35	-17	-10	28	20	42
Second finger temp.	08	-13	-07	13	-14	22	12
Respiration period	-19	-33	36	15	-02	04	30
Pupil diameter*	37	22	-16	25	24	-10	34
Dermographia persist.	11	21	18	-14	-17	-14	16
Systolic b. p.*	36	-25	-19	-18	-30	21	39

* indicates reflection of variable.

Maximum N = 166

Table 2-J.2

ROTATED FACTOR SOLUTION FOR PRE-STIMULUS PHYSIOLOGICAL MEASURES, AND EQUATION FOR ESTIMATION OF A GENERAL AUTONOMIC FACTOR

	Factors						
Variables	I	II	III	IV	V	VI	I-A
Salivary output	06	47	07	05	04	04	02
Sublingual temp.*	14	01	52	14	15	-04	37
Palmar cond.*	07	-04	07	08	15	-49	33
Volar cond.*	-04	04	00	11	31	-10	16
Heart period	36	-34	20	13	32	-10	52
2nd. Fing. temp.	29	05	11	01	-06	12	05
Respir. period	-08	01	44	-27	-16	01	-01
Pupil diameter*	-02	02	01	56	13	-06	12
Derm. persist.	-08	26	-15	-04	02	-23	03
Systolic b. p.*	59	-03	-07	-05	03	-17	34

* indicates reflection of variable.

Maximum N = 166

Factor I-A = $.25z_2 + .19z_3 + .10z_4 + .37z_5 + .21z_{10}$

$z_i = (X_i - \overline{X}_i) / \sigma_i$

The regression equation for estimating Factor IA is shown in Table 2-J.2. Althcugh pupil diameter had a loading of .12 on the factor, its beta weight in the equation was only .02, and therefore it was omitted from the equation. Factor scores were calculated for all subjects and standardized as T scores with a mean of 50 and a standard deviation of 10, scores above the mean being indicative of relative PNS dominance and scores below the mean indicative of relative SNS dominance.

Since it was difficult to place any interpretation on the other factors in Table 2-J.2, only estimates of Factor IA were employed in these studies. Factor analysis of the reactivity data was not repeated. There is no theoretical framework for predicting a factor or factors for reactivity to cold pressor stimulation, and the results of the first factor analysis provided no encouragement for the thesis that a general factor or any other meaningful factor might be found.

4. Pattern Analysis of the Corrected Physiological Data

After factor analysis, the pre-stimulus physiological data were analyzed in terms of multivariate patterns according to a method developed by Wenger (1957). An individual profile of the standard scores for the physiological variables was plotted for each subject and a count was made of the number of deviations of 1/2 sigma or greater above or below the normative means in a sub-set of five variables: salivary output, sublingual temperature, palmar conductance, heart period and systolic blood pressure. Each profile then was classified, according to

the pattern of deviation exhibited, as belonging to one of the categories of patterns described in Table 2-K. Patterns S and P are ones in which the deviations consistently indicate relative sympathetic and relative parasympathetic dominance respectively. Pattern B is a specific mixed pattern found by Wenger to occur with about the same frequency as patterns S and P in a normative sample of males. PS1 and PS2 are additional mixed patterns, not previously identified, which appeared in the present sample with frequencies approaching that of pattern P. Pattern M, finally, is a pattern in which the majority of the scores for the five variables deviate less than 1/2 sigma from the normative means.

In Wenger's pattern analysis of data on male subjects, dermographia persistence and finger temperature were employed in addition to the five variables shown in Table 2-K. The criteria of classification for patterns S, P and B were four or more consistent deviations with no more than one inconsistent deviation, or five or more consistent deviations with no more than two inconsistent ones. Pattern M was defined as fewer than four deviations. All profiles which did not fall into one of these four pattern categories were placed in a category of mixed patterns. The selection of variables was based in part upon their correlations with the autonomic factor for males. Similar considerations guided the selection of variables for the present pattern analysis, but it was decided to retain salivary output as one of the variables even though it did not appear on the general autonomic factor in the second factor analysis. Since fewer variables were employed, the

Table 2-K

AUTONOMIC PATTERNS DEFINED BY LEVELS OF ACTIVITY IN FIVE PHYSIOLOGICAL VARIABLES, AND THEIR FREQUENCIES IN NORMATIVE AND RESPONDENT SAMPLES

Pattern Definitions

	Salivary output	Sublingual temperature	Palmar conduct.	Heart period	Systolic blood pr.
P	high(+)	low(+)	low(+)	long(+)	low(+)
PS1	low(-)	low(+)	low(+)	long(+)	low(+)
M	mean	mean	mean	mean	mean
S	low(-)	high(-)	high(-)	short(-)	high(-)
PS2	high(+)	high(-)	low(+)	short(-)	low(+)
B	low(-)	low(+)	low(+)	short(-)	high(-)

Percentage Frequencies

	Normative group (N=166)	First-year follow-up (N=122)	Sixth-year follow-up (N=127)	Male AAF Cadets (N=100)
P	10	9	9	14
PS1	6	7	6	—
M	25	29	28	11
S	17	17	17	13
PS2	9	7	9	—
B	3	2	3	15
Unclassified	30	29	28	47

+ indicates a deviation from the normative mean of 1/2 σ or greater in a direction indicative of apparent dominance of parasympathetic nervous system activity (standard score of 55.0 or greater).
- indicates a deviation from the normative mean of 1/2 σ or greater in a direction indicative of apparent dominance of sympathetic nervous system activity (standard score of 45.0 or less).

criteria of classification were changed to three consistent deviations with no inconsistent ones, or four or more consistent deviations with no more than one inconsistent deviation, and pattern M was defined as fewer than three deviations.

Table 2-K shows the frequency distributions of the autonomic patterns, in terms of percentages, in the normative sample of 166 cases and in the sub-samples of respondents in the first and sixth year follow-up studies. The frequency distribution of patterns in Wenger's normative male sample of Army Air Force cadets is shown for comparison. It can be seen that the relative frequency of pattern M was much higher and that of pattern B much lower in the female sample than in the male sample. These differences evidently were not methodological artifacts, for when another analysis was made, employing seven variables and Wenger's original criteria of classification, the frequency of pattern M remained the same and that of pattern B became even lower. While it is possible that pattern B is characteristic only of males, its low incidence in the female sample alternatively could be related to the fact that the teachers constituted a more highly selected group than Wenger's AAF cadets.

Where statistical tests were made of the relations between the autonomic patterns and other data in subsequent tables, comparisons were made between the combined frequencies of patterns P and PS1 and the combined frequencies of patterns S, PS2 and B in order not to have zero or very low frequencies within many cells when cross-classifications were made. The

basis for placing patterns P and PS1 in the same category was their physiological similarity; one is a pure parasympathetic pattern and the other a predominantly parasympathetic pattern. Patterns S, PS2 and B, on the other hand are physiologically dissimilar; their only common element is a short heart period. It appeared, however, on preliminary inspection of the data that the distribution of pattern PS2 across other subject classifications often followed a trend similar to that of pattern S. These two patterns therefore were placed in the same category, and pattern B was added to this category, despite its very low frequency of occurrence in the present sample, because patterns S and B both have been found in previous studies of males (Wenger, 1957; Wenger, 1966) to appear with relatively high frequencies in certain deviant groups.

III. PSYCHOPHYSIOLOGICAL CORRELATES OF TEACHING PERFORMANCE DURING THE FIRST IN-SERVICE YEAR

1. Evaluation of In-service Teaching Performance

The instrument employed for the evaluation of teaching performance at the end of the first in-service year was the Confidential Teacher Rating Scale (CTRS), developed by Lucio (Appendix H). The CTRS is a bi-polar scale providing for choices between two descriptive alternatives on twelve items related to teaching performance. Items 1 through 5 of the scale constitute a sub-scale concerned with classroom behavior, and items 6 through 11 a sub-scale concerned with teacher-parent relations. Item 12 is a rating of emotional stability. Four items on health, absences, and employment status complete the instrument. On each of the first 12 items of the CTRS, the alternative checked by the rater was scored as either a favorable (F) or unfavorable (UF) rating. A favorable rating was represented by the first alternative on items 2-5 and 7-12, and by the second alternative on items 1 and 6. Since a majority of the subjects in this study received favorable ratings on all items, and few received unfavorable ratings on more than two or three items, there seemed little reason to derive numerical scores representing relative degrees of satisfactory performance. The ratings therefore were evaluated only in terms of whether or not a teacher received any unfavorable ratings on the two sub-scales or on the emotional stability item.

The CTRS was completed by elementary school principals for teacher-subjects who had been employed full-time for the first year of teaching. Prior to sending copies of the CTRS to the principals, telephone calls were made to describe the purposes of the study, the procedures in administering the instrument, and the confidential nature of the inquiry. The CTRS was then mailed with a covering letter (Appendix H) containing the same content as communicated by telephone. Completed CTRS forms were received for 122 of the 166 subjects, a 73% return. Subjects not rated by principals (because of lack of time for observation) included substitute teachers who may have taught for only a few days in the particular principal's school or teachers recently transferred to a school.

2. Relations of In-service Teaching Performance to the Psychophysiological Test Battery

Of the 122 subjects in the sample of 166, for whom evaluations on the Confidential Teacher Rating Scale were obtained, 71 received favorable ratings on all items of the scale. For comparison with this group (F), the 51 subjects who received one or more unfavorable ratings (group UF) were classified additionally into three overlapping subgroups: those with unfavorable ratings on two or more items relating to classroom behavior (CB), those with unfavorable ratings on one or more items relating to teacher-parent relations (TP), and those rated emotionally unstable (ES).

Although the latter group contained only 8 subjects, it was considered to be of particular interest in view of the hypothesis that emotional stability is related to autonomic nervous system functioning. The differences between the means of group F and the means of each of the unfavorably rated groups for all of the variables in the psychophysiological test battery were tested for significance by t tests.

The means of the pre-stimulus physiological measures for the groups are presented in Table 2-L. Group CB was found to have a significantly longer mean heart period than group F, and group TP significantly higher mean systolic and pulse pressures. Groups UF and ES, however, did not differ significantly from group F with respect to any of the variables, and there was no evident trend in the direction of the mean differences between group F and any of the other groups to indicate a general tendency toward a relatively greater degree of either sympathetic or parasympathetic nervous system activity in the unfavorably rated groups. The mean autonomic factor scores for the unfavorably rated groups did not differ significantly from the mean for group F, and the distribution of autonomic patterns, as shown in Table 2-M, was similar within each group. Although it appears in Table 2-M that the proportion of subjects receiving unfavorable ratings on the CTRS was somewhat higher among those having parasympathetic patterns than among those having sympathetic or mixed patterns, the results of the chi-square tests indicated no

Table 2-L

STANDARDIZED MEANS OF PRE-STIMULUS PHYSIOLOGICAL MEASURES FOR SUBJECTS CLASSIFIED ACCORDING TO RATINGS ON THE CONFIDENTIAL TEACHER RATING SCALE (CTRS)

	F	UF	CB	TP	ES
Ns for groups:	71	51	22	19	8
Salivary output	48.9	50.3	48.8	49.4	51.1
Sublingual temperature*	51.1	48.5	49.9	47.9	46.1
Palmar conductance*	50.0	50.8	49.1	49.9	50.5
Volar conductance*	50.3	50.2	47.2	50.0	51.9
Log conductance change	47.9	52.0	48.1	52.3	49.7
Systolic blood pressure*	51.4	48.2	51.5	<u>44.3</u>	51.6
Diastolic blood pressure*	50.0	49.6	51.7	48.7	55.6
Pulse pressure	48.7	51.6	50.0	<u>54.5</u>	53.3
Heart period	49.3	52.3	<u>55.1</u>	50.7	49.9
Respiration period	50.4	49.8	50.3	47.2	46.5
Pupil diameter*	49.0	51.8	49.8	53.1	50.6
Dermographia persistence	49.6	51.1	51.2	50.4	52.7
Dermographia latency*	49.9	50.2	51.8	52.3	54.7
Face temperature*	49.9	48.7	48.1	49.3	46.4
Axillary temperature*	50.1	51.4	50.0	51.5	55.4
First Finger temperature	47.9	50.0	50.8	52.5	51.4
Second Finger temperature	49.7	50.5	51.8	50.9	48.3
Finger pulse volume	50.3	49.2	47.3	49.7	46.7
Stomach period	51.7	48.9	51.5	50.7	47.0
Factor I-A	50.4	50.5	52.6	48.0	49.6

Underlined means differ significantly from the means of group F at the .05 level.
* indicates reflection of variable.

F = rated favorably on all items of CTRS.
UF = rated unfavorably on one or more items of CTRS.
CB = rated unfavorably on two or more items of CTRS Classroom Behavior sub-section.
TP = rated unfavorably on one or more items of CTRS Teacher-Parent Relations sub-section.
ES = rated emotionally unstable.

Table 2-M

FREQUENCIES OF AUTONOMIC PATTERNS WITHIN CATEGORIES OF OF RATINGS ON THE CONFIDENTIAL TEACHER RATING SCALE (CTRS)

	F	UF	CB	TP	ES
P	7	4	2	1	1
PS1	4	4	3	1	0
M	20	15	6	5	1
S	13	8	2	2	1
PS2	5	4	1	1	1
B	2	0	0	0	0
Unclassified	20	16	8	9	4

	F	UF	CB	TP	ES
P + PS1	11	8	5	2	1
S + PS2 + B	20	12	3	3	2
Chi-square		.11	.99	—	—

F = rated favorably on all items of CTRS.
UF = rated unfavorably on one or more items of CTRS.
CB = rated unfavorably on two or more items of CTRS Classroom Behavior sub-section.
TP = rated unfavorably on one or more items of CTRS Teacher-Parent Relations sub-section.
ES = rated emotionally unstable.

statistically significant degree of association between autonomic patterns and CTRS ratings. The means of the reactions to cold pressor for the groups are shown in Table 2-N. Group CB had a significantly lesser finger pulse volume reaction, and group TP a significantly greater systolic blood pressure reaction than group F. It cannot be said, however, that any of the unfavorably rated groups showed an overall tendency to be either more or less reactive than group F.

The means of the muscle tension ratings and Guilford-Zimmerman scores are shown in Table 2-O. The differences between the means of all the muscle tension ratings for the groups were consistent in indicating an association of higher muscle tension with unfavorable ratings on the CTRS, although only the differences between groups F and TP for the supervisors' ratings and mean ratings were statistically significant. No clear pattern of differences between groups was apparent in the Guilford-Zimmerman scores. The only statistically significant mean difference was that between groups F and CB on Sociability (S). This difference was in the direction that would be expected, indicating that teachers with unfavorable ratings on items relating to classroom behavior tend to be less sociable than favorably rated teachers, but it is surprising that the group with unfavorable ratings on items relating to teacher-parent relations did not show the tendency also. The mean score on emotional stability (E) for group ES was, as expected, lower than the mean for group F, although the difference was not statistically significant.

Table 2-N

STANDARDIZED MEANS OF PHYSIOLOGICAL REACTIONS TO COLD PRESSOR STIMULATION FOR SUBJECTS CLASSIFIED ACCORDING TO RATINGS ON THE CONFIDENTIAL TEACHER RATING SCALE (CTRS)

	F	UF	CB	TP	ES
Ns for groups:	69	49	20	18	8
Systolic blood pressure	49.2	52.1	51.5	<u>57.0</u>	53.5
Diastolic blood pressure	51.1	51.0	48.5	53.1	48.2
Pulse pressure*	51.7	49.2	47.6	47.0	45.9
Heart rate	49.9	51.0	50.3	51.9	53.5
Respiration rate	49.1	49.7	48.8	48.0	48.3
Palmar conductance	49.4	52.2	53.4	51.8	50.5
Finger temperature*	49.9	50.8	46.5	49.7	44.7
Face temperature	49.7	50.8	48.6	51.4	53.4
Axillary temperature	49.2	50.0	50.7	50.6	48.2
Finger pulse volume*	52.2	47.2	<u>44.4</u>	48.9	45.8
Stomach period*	49.4	49.3	47.7	50.9	—

Underlined means differ significantly from the means of group F at the .05 level.
* indicates reflection of variable.

F = rated favorably on all items of CTRS.
UF = rated unfavorably on one or more items of CTRS.
CB = rated unfavorably on two or more items of CTRS Classroom Behavior sub-section.
TP = rated unfavorably on one or more items of CTRS Teacher-Parent Relations sub-section.
ES = rated emotionally unstable.

Table 2-O

STANDARDIZED MEANS OF MUSCLE TENSION RATINGS AND GUILFORD-ZIMMERMAN SCORES FOR SUBJECTS CLASSIFIED ACCORDING TO RATINGS ON THE CONFIDENTIAL TEACHER RATING SCALE (CTRS)

	F	UF	CB	TP	ES
Ns for groups:	64	39	16	16	8
Muscle tension (Sup.)	50.6	51.0	54.4	<u>58.3</u>	58.3
Muscle tension (Obs.)	49.0	51.2	51.8	53.5	51.8
Muscle tension (Mean)	49.4	50.9	54.5	<u>57.7</u>	57.3

	F	UF	CB	TP	ES
Ns for groups:	62	42	16	15	5
G.-Z. scale G	49.8	50.8	47.9	52.0	49.0
G.-Z. scale R	49.7	51.2	51.3	54.2	56.4
G.-Z. scale A	50.5	49.4	48.4	50.6	58.7
G.-Z. scale S	51.4	49.8	<u>45.1</u>	51.5	52.2
G.-Z. scale E	50.7	49.3	48.7	46.6	46.3
G.-Z. scale O	50.3	50.0	52.0	48.5	51.0
G.-Z. scale F	50.8	49.5	49.4	47.3	45.1
G.-Z. scale T	49.7	51.0	48.8	54.7	54.5
G.-Z. scale P	50.7	48.0	47.0	49.2	48.2
G.-Z. scale M	50.9	50.3	54.2	53.2	51.8
G.-Z. question marks	50.3	49.0	49.8	49.4	47.7

Underlined means differ significantly from the means of group F at the .05 level.

F = rated favorably on all items of CTRS.
UF = rated unfavorably on one or more items of CTRS.
CB = rated unfavorably on two or more items of CTRS Classroom Behavior sub-section.
TP = rated unfavorably on one or more items of CTRS Teacher-Parent Relations sub-section.
ES = rated emotionally unstable.

3. Relations of In-service Teaching Performance to Student Teaching Performance

The relations of the ratings on the CTRS to the criteria of teaching performance employed in the first study are shown in Table 2-P. It is evident from this table that there is little concordance between the two evaluations of teaching performance. While the means of the supervisors' ratings and University ratings of student teaching performance consistently were lower for the groups having unfavorable ratings on the CTRS than for the favorably rated group, the differences all were quite small and statistically insignificant. The means of the ratings of student teaching performance by the outside observer, which in the first study had relatively low correlations with the supervisors' and University ratings (cf. Table 1-O), did not show even this degree of consistency with the CTRS ratings. Possibly these results indicate that in-service teaching performance is not related to performance in student teaching, but it seems more probable that they reflect the difficulty of obtaining adequate assessments of teaching performance. It may be that the indices of performance provided by the instruments employed in these studies either relate to different aspects of teacher behavior or simply lack validity.

4. Discussion and Conclusions

The major findings in this study are the associations of higher muscle tension ratings and lower scores on the Guilford-Zimmerman Sociability scale with unfavorable ratings on he CTRS.

Table 2-P

STANDARDIZED MEANS OF STUDENT TEACHING PERFORMANCE RATINGS FOR SUBJECTS CLASSIFIED ACCORDING TO RATINGS ON THE CONFIDENTIAL TEACHER RATING SCALE (CTRS)

	F	UF	CB	TP	ES
Ns for groups:	68	44	19	16	8
Teacher behavior (Sup.)	51.8	50.6	51.5	49.8	47.0
Teacher behavior (Obs.)	51.4	49.9	52.0	53.9	53.7
Teacher behavior (Mean)	51.6	50.8	52.0	51.6	49.0
Pupil behavior (Sup.)	51.2	50.1	51.1	49.3	49.0
Pupil behavior (Obs.)	51.5	49.1	47.3	51.0	48.7
Pupil behavior (Mean)	51.4	50.2	49.7	49.9	48.6
Total rating (Sup.)	51.7	50.6	51.5	49.8	47.4
Total rating (Obs.)	51.5	51.1	51.0	53.3	52.7
Total rating (Mean)	51.6	50.7	51.6	51.3	49.6
University rating	51.3	49.5	47.9	48.6	48.0

F = rated favorably on all items of CTRS.
UF = rated unfavorably on one or more items of CTRS.
CB = rated unfavorably on two or more items of CTRS Classroom Behavior sub-section.
TP = rated unfavorably on one or more items of CTRS Teacher-Parent Relations sub-section.
ES = rated emotionally unstable.

These results confirm the conclusions of the initial study that teaching performance is negatively related to level of muscle tension and positively related to sociability. The few significant physiological differences between teachers with wholly favorable ratings on the CTRS and those with unfavorable ratings on items relating either to classroom behavior or to teacher-parent relations, on the other hand, do not conform to the tendencies indicated by the correlations of the physiological measures with the criteria of performance in the initial study (cf. Tables 1-P and 1-Q), and the nature of these differences does not seem to afford any basis for interpreting them in terms of differential degrees of autonomic balance or imbalance. Inasmuch as no significant relations were found between CTRS ratings and autonomic factor scores or multivariate patterns of autonomic activity, it must be concluded that the present study provides no clear evidence that these measures of teaching performance are related to individual differences in characteristic levels of autonomic nervous system functioning.

IV. PSYCHOPHYSIOLOGICAL CORRELATES OF PROFESSIONAL AND HEALTH STATUS DURING THE SIXTH IN-SERVICE YEAR

At the end of the sixth in-service year of teaching data were collected on the health and professional status of the 166 subjects. Two instruments developed for this study were utilized: (1) the General Health Inventory, and (2) the Professional Status Inventory. Relationships between the data obtained on these two instruments and the psychophysiological test battery and measures of first-year teaching were investigated.*

1. Evaluation of Health Status

The General Health Inventory (adapted for females from a similar inventor utilized in studies of male Air Force personnel (Wenger, 1966)) lists forty-three disorders, most of which are usually considered to be psychosomatic (Appendix I). The subjects were requested to indicate: (a) which, if any, of the listed disorders they had experienced at any time before or after undergoing the psychophysiological tests, (b) whether or not they had been treated or hospitalized for any of the disorders, and (c) if they had experienced other disorders. The General Health Inventory (and the Professional Status Inventory) were mailed directly to the subjects with a covering letter (Appendix I).

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* Valuable assistance in this phase of the investigation was provided by Mrs. Carolyn Ellner, Post Graduate Research Assistant, UCLA.

Completed inventories were received from 127 of the 166 subjects, a 76% return. Thirty-nine of the subjects reported that they had never experienced any of the listed disorders or any other disorders which could be classified as psychosomatic. Since relatively few subjects reported having first experienced a disorder after testing or having been hospitalized, evaluations of health status were made only in terms of occurrence versus non-occurrence of the disorders, without regard to time of onset or severity. Most of the disorders, moreover, had such low incidences of occurrence in the sample that it was not possible to investigate the relations of each specific disorder to the psychophysiological test battery. Therefore, for statistical analyses of the data, the disorders were classified into six major categories, omitting some of the listed disorders, but including all of the more frequently reported ones. The six categories for which the Ns were large enough for statistical analyses were skin disorders (SK), gastrointestinal disorders (GI), anxiety and other nervous disorders (AX), headaches (HD), certain respiratory disorders (RP), and menstrual disorders (MN). The very low incidence of certain disorders such as peptic ulcers and asthma, which would have been of particular interest, unfortunately precluded their individual consideration. Since many subjects reported having several disorders, there was some overlap in the Ns for the six major disorder groups. The means of the variables in the psychophysiological test battery were obtained for each of the disorder groups, and their differences from the means of the group who reported no disorders (ND) were tested for significance by t tests.

2. Relations of Health Status to the Psychophysiological Test Battery

The means of the pre-stimulus physiological measures for group ND and the six disorder groups are shown in Table 2-Q. The gastrointestinal, anxiety, and respiratory disorder groups were found to have significantly shorter mean heart periods and significantly lower mean autonomic factor scores than the group with no disorders, the directions of the differences in both variables being indicative of greater relative SNS dominance in these disorders. The mean heart periods and autonomic factor scores for the other disorder groups also were lower, although not significantly so, than the means for group ND. No general tendency toward a consistent ern of relative sympathetic dominance in all variables any of the disorders is evident from the table, but the analysis of the multivariate patterns in Table 2-R suggests an association of SNS dominance with psychosomatic disorders and an association of PNS dominance with an absence of disorders. The incidence of pattern S was higher than that of pattern P within each category of disorder, but lower within the group having no disorders. Pattern P, furthermore, was the only one for which a majority of subjects having the pattern reported no disorders. Half of the subjects having pattern PS1, which is physiologically similar to pattern P, had no disorders, but in each of the other classes of patterns the majority of the subjects had one or more disorders. The results of the chi-square tests in Table 2-R show that among subjects within each of the disorder categories except headaches the ratio of parasympathetic patterns

Table 2-Q

STANDARDIZED MEANS OF PRE-STIMULUS PHYSIOLOGICAL MEASURES FOR SUBJECTS REPORTING THE OCCURRENCE OF CERTAIN KINDS OF DISORDERS

	ND	SK	GI	AX	HD	RP	MN
Ns for groups:	39	17	29	14	19	28	30
Salivary output	50.3	46.3	45.8	48.4	45.8	51.3	49.5
Sublingual temperature*	50.7	50.0	50.2	45.5	50.5	49.7	51.1
Palmar conductance*	49.5	48.5	48.4	49.0	49.5	49.4	48.8
Volar conductance*	50.5	49.4	47.3	49.8	47.7	49.2	52.2
Log conductance change	50.1	50.4	53.1	50.9	50.5	51.4	50.7
Systolic blood pressure*	51.9	47.5	47.3	51.6	50.8	52.3	50.6
Diastolic blood pressure*	51.3	47.8	49.8	52.5	52.6	50.6	53.4
Pulse pressure	49.3	50.6	52.2	50.2	50.9	48.4	51.6
Heart period	54.4	48.7	<u>47.9</u>	<u>46.2</u>	49.7	<u>45.2</u>	50.1
Respiration period	50.3	50.5	48.9	50.6	50.3	48.1	49.2
Pupil diameter	52.0	51.8	49.9	48.8	49.3	49.7	50.3
Dermographia persistence	47.6	51.6	48.6	52.9	48.5	50.9	49.8
Dermographia latency*	50.4	52.2	52.9	50.0	50.1	48.7	49.6
Face temperature*	51.0	52.1	49.8	50.2	50.4	51.6	45.6
Axillary temperature*	50.1	52.6	52.2	50.8	51.3	48.9	50.9
First Finger temperature	49.0	49.1	49.8	52.4	50.9	50.8	47.2
Second Finger temperature	50.4	49.0	51.8	52.2	50.1	49.9	50.9
Finger pulse volume	47.7	46.7	50.6	49.0	50.3	49.7	51.0
Stomach period	49.9	50.2	51.1	54.0	51.5	50.9	50.8
Factor A-1	53.4	48.1	<u>47.3</u>	<u>46.5</u>	49.9	<u>47.9</u>	50.8

Underlined means differ significantly from means of group ND at the 5% level of confidence.
* indicates reflection of variable.

ND = no disorders reported.
SK = skin disorders (boils, eczema, shingles, skin rashes, excessive sweating).
GI = gastrointestinal disorders (constipation, diarrhea, hemorrhoids, ulcers, etc.).
AX = anxiety (anxiety, fear, depression, nervousness, nervous breakdown).
HD = headaches (frequent headaches, migraine headaches).
RP = respiratory disorders (hay fever, sinus trouble).
MN = menstrual disorders (pain during menstruation, pre-menstrual tension).

Table 2-R

FREQUENCIES OF AUTONOMIC PATTERNS WITHIN DISORDER CATEGORIES

	ND	SK	GI	AX	HD	RP	MN	D
P	7	0	2	0	2	0	3	5
PS1	4	1	1	0	2	1	1	4
M	10	3	7	1	2	10	7	25
S	5	5	9	5	6	4	7	16
PS2	0	2	0	4	2	8	3	12
B	1	2	2	1	1	0	1	3
Unclassified	12	4	8	3	4	5	8	23

	ND	SK	GI	AX	HD	RP	MN	D
P + PS1	11	1	3	0	4	1	4	9
S + PS2 + B	6	9	11	10	9	12	11	31
Chi-square		5.37*	5.81*	8.32*	3.39	7.78*	4.63*	9.33*

* indicates that Chi-square for the comparison of the pattern distribution with the distribution in group ND is significant at the .05 level.

ND = no disorders reported.
SK = skin disorders (boils, eczema, shingles, skin rashes, excessive sweating).
GI = gastrointestinal disorders (constipation, diarrhea, hemorrhoids, ulcers, etc.).
AX = anxiety (anxiety, fear, depression, nervousness, nervous breakdown).
HD = headaches (frequent headaches, migraine headaches).
RP = respiratory disorders (hay fever, sinus trouble).
MN = menstrual disorders (pain during menstruation, pre-menstrual tension).
D = o e or more disorders reported.

(P and PS1) to sympathetic and mixed patterns (S, PS2 and B) was significantly smaller than among subjects having no disorders. It may be noted, too, that pattern S was the modal pattern in each disorder group except RP.

It is evident from Table 2-S, in which the mean reactions to cold pressor stimulation are shown, that there were no tendencies toward hyper-reactivity in any of the disorder groups. Only two statistically significant differences between means were found; the skin disorder group had a smaller palmer conductance reaction and the menstrual disorder group a smaller finger pulse volume reaction than the group having no disorders.

It was thought that increased muscular tension might be characteristic of many psychosomatic disorders, and particularly of anxiety and other nervous disorders. As shown in Table 2-T, however, there was no general tendency for the mean muscle tension ratings of the disorder groups to be higher than those of the group with no disorders. Although the anxiety group, as expected, had the highest mean muscle tension ratings, they were not significantly higher than the mean ratings of group ND. The means of the Guilford-Zimmerman scores in Table 2-T exhibit little relationship to the categories of psychosomatic disorders. The only statistically significant difference was that between the means of groups HD and ND on the femininity-masculinity scale. The indicated association of headaches with a lesser degree of femininity is not one that would have been predicted.

Table 2-S

STANDARDIZED MEANS OF REACTIONS TO COLD PRESSOR STIMULATION FOR SUBJECTS REPORTING THE OCCURRENCE OF CERTAIN KINDS OF DISORDERS

	ND	SK	GI	AX	HD	RP	MN
Ns for groups:	38	17	29	14	18	27	30
Systolic b. p.	49.9	49.5	53.2	51.6	51.0	50.4	48.4
Diastolic b. p.	51.1	51.0	52.0	47.6	50.7	50.5	48.4
Pulse pressure*	50.7	49.5	48.5	46.2	51.2	50.4	49.5
Heart rate	49.7	52.5	50.6	49.5	50.0	49.4	48.6
Respiration rate	47.8	52.9	52.7	52.8	52.2	48.5	51.3
Palmar conductance	53.3	46.3	48.3	48.3	49.6	48.8	49.0
Finger temperature*	49.0	46.9	49.4	43.8	50.7	51.5	48.6
Face temperature	48.8	50.3	51.0	51.8	54.4	49.4	52.1
Axillary temperature	50.2	51.8	49.7	47.6	50.0	49.8	49.9
Finger pulse volume*	52.8	47.4	48.7	48.3	48.1	48.6	45.8
Stomach period*	47.4	43.8	51.9	46.0	52.4	50.4	41.4

Underlined means differ significantly from the means of group ND at the .05 level.
* indicates reflection of variable.

ND = no disorders reported.
SK = skin disorders (boils, eczema, shingles, skin rashes, excessive sweating).
GI = gastrointestinal disorders (constipation, diarrhea, hemorrhoids, ulcers, etc.).
AX = anxiety (anxiety, fear, depression, nervousness, nervous breakdown).
HD = headaches (frequent headaches, migraine headaches).
RP = respiratory disorders (hay fever, sinus trouble).
MN = menstrual disorders (pain during menstruation, pre-menstrual tension).

Table 2-T

STANDARDIZED MEANS OF MUSCLE TENSION RATINGS AND GUILFORD-ZIMMERMAN SCORES FOR SUBJECTS REPORTING THE OCCURRENCE OF CERTAIN KINDS OF DISORDERS

	ND	SK	GI	AX	HD	RP	MN
Ns for groups:	30	17	23	13	15	26	25
Muscle ten. (S)	51.6	47.9	51.2	51.8	50.1	50.8	48.6
Muscle ten. (O)	48.5	47.9	51.4	53.2	47.6	48.5	49.2
Muscle ten. (M)	50.4	46.6	51.0	52.1	49.0	49.4	48.2

	ND	SK	GI	AX	HD	RP	MN
Ns for groups:	33	17	27	13	16	28	27
G.-Z. scale G	49.2	49.6	51.6	49.7	49.6	50.6	48.2
G.-Z. scale R	48.0	52.1	50.8	51.6	44.0	52.3	50.5
G.-Z. scale A	52.5	51.8	47.8	47.7	47.1	49.5	50.6
G.-Z. scale S	50.7	50.8	49.9	49.1	47.9	50.9	46.7
G.-Z. scale E	49.4	44.6	47.9	44.4	46.1	51.0	47.6
G.-Z. scale O	50.9	50.8	50.6	48.8	48.5	51.0	48.5
G.-Z. scale F	50.2	47.2	52.1	49.5	48.7	49.7	49.6
G.-Z. scale T	49.5	51.7	52.4	54.6	52.2	50.0	51.4
G.-Z. scale P	50.6	50.2	50.9	52.4	48.5	49.8	49.1
G.-Z. scale M	50.6	46.0	48.5	47.3	<u>43.3</u>	49.5	48.9
G.-Z. quest.	48.7	49.7	51.9	48.3	49.7	47.6	51.2

Underlined means differ significantly from the means of group ND at the .05 level.

ND = no disorders reported.
SK = skin disorders (boils, eczema, shingles, skin rashes, excessive sweating).
GI = gastrointestinal disorders (constipation, diarrhea, hemorrhoids, ulcers, etc.).
AX = anxiety (anxiety, fear, depression, nervousness, nervous breakdown).
HD = headaches (frequent headaches, migraine headaches).
RP = respiratory disorders (hay fever, sinus trouble).
MN = menstrual disorders (pain during menstruation, pre-menstrual tension).

3. Evaluation of Teaching Status

The Professional Status Inventory (Appendix J) contains items on: marital status, teaching status, number of teaching positions held, tenure status, and the extent of post-graduate academic and career training. This inventory was mailed with the Health Status Inventory and completed forms were received from 127 of the 166 subjects, a 76% return.

On the basis of the responses to item 3 (teaching status) and item 5 (tenure status) of the inventory, the subjects were classified into groups representing different levels of success in the teaching profession. Whether or not a teacher had obtained tenure was taken as the principal criterion of success; it at least was evidence that the teachers' performance was deemed satisfactory by school administrators. Failure to obtain tenure, while not necessarily indicative of professional inadequacy, was taken to represent a lesser degree of success; and teachers who had left the profession, apparently for good, were considered to be the least successful. In the statistical analyses of the psychophysiological test data by t tests, then, the teachers who had obtained tenure (group T) were compared with those who had not obtained tenure (group NT1) and with two overlapping sub-groups within group NT1: those who had spent less than three years in teaching since graduation from college (group NT2), and those who were not teaching at the time of the survey and who indicated that they did not intend to return to teaching (group NR). A high proportion of those in group NT1, and some of those in

group T, were not teaching at the time of the survey, but those who indicated an intention to resume teaching in the near future were not included in group NR. Groups T and NR were considered to represent the upper and lower extremes with respect to professional success, with groups NT1 and NT2 occupying an intermediate position.

It was evident from an initial inspection of the data that one important factor related to whether or not a teacher had obtained tenure was the extent to which maternal duties had made demands upon her time. There was an obvious tendency for group T to be loaded in favor of childless teachers and for group NT1 to be loaded in favor of teachers with children. It is reasonable to suppose that many teachers in the latter group would have obtained tenure if they had been given the opportunity to devote more of their time to teaching. Further comparisons, therefore, were made between two additional sub-groups: those who had obtained tenure despite having children (group TC), and those who were childless but who had not obtained tenure (group NTN). It was thought that if there were any tendencies for the psychophysiological tests to discriminate between more and less successful teachers, possibly the differentiation between groups TC and NTN might be clearer than between groups T and NT1.

4. Relations of Teaching Status to the Psychophysiological Test Battery

The means of the pre-stimulus physiological measures for the tenured and non-tenured teachers are shown in Table 2-U.

Table 2-U

STANDARDIZED MEANS OF PRE-STIMULUS PHYSIOLOGICAL MEASURES FOR SUBJECTS CLASSIFIED ACCORDING TO TEACHING STATUS

	T	NT1	NT2	NR	TC	NTN
Ns for groups:	50	77	36	25	20	18
Salivary output	50.1	49.2	49.9	48.3	52.8	50.3
Sublingual temp.*	51.7	50.0	50.6	52.3	51.3	51.2
Palmar conductance*	48.7	50.4	51.2	53.7	49.2	50.7
Volar conductance*	52.0	49.7	48.9	49.3	51.5	49.7
Log cond. change	51.2	50.5	50.6	54.4	52.3	50.2
Systolic b. p.*	48.5	49.1	49.8	51.4	48.7	53.2
Diastolic b. p.*	50.7	49.8	50.3	50.3	49.9	53.0
Pulse pressure	51.9	49.1	50.4	49.2	51.2	49.3
Heart period	48.6	51.2	50.5	54.0	50.3	50.2
Respiration period	50.2	49.9	50.3	47.2	50.2	48.0
Pupil diameter*	50.9	50.9	52.3	50.0	53.4	49.2
Derm. persist.	49.3	49.0	48.3	50.2	50.3	49.6
Derm. latency*	50.4	49.9	50.3	51.7	51.2	50.5
Face temperature*	45.9	52.4	50.1	50.4	47.6	51.2
Axillary temp.*	48.9	51.3	50.9	52.7	53.7	50.1
1st Finger temp.	47.7	50.8	51.3	50.9	48.6	53.4
2nd Finger temp.	51.0	51.3	51.4	50.9	50.3	54.7
Finger pulse vol.	51.5	49.3	49.0	46.6	49.7	47.2
Stomach period	48.5	50.4	51.4	52.1	47.5	50.2
Factor I-A	49.5	51.2	50.8	54.6	50.4	50.9

Underlined means differ significantly from the means of group T at the .05 level.
* indicates reflection of variable.

T = tenured teachers.
NT1= non-tenured teachers.
NT2= non-tenured teachers who had taught for less than 3 years.
NR = teachers who had left the profession and did not intend to return.
TC = tenured teachers with children.
NTN= non-tenured teachers without children.

Evidence of a difference in physiological functioning between the more and less successful teachers is afforded by the finding that the teachers who had left the profession differed significantly from the tenured teachers in palmar conductance, heart period, and autonomic factor scores. All these differences are indicative of relatively greater PNS dominance in the less successful group. The only significant difference between the tenured teachers and the total group of non-tenured teachers, however, was in face temperature, while no significant differences were found between groups TC and NTN. The frequency distributions of autonomic patterns shown in Table 2-V provides further evidence of an association between relative PNS dominance and a lesser degree of success in the teaching profession. There were statistically significant tendencies for the relative number of subjects with parasympathetic patterns to be greater and the relative number of subjects with sympathetic and mixed patterns to be smaller in groups NT1 and NR than in group T. Only 15% of the subjects having patterns P or PS1 had obtained tenure at the time of this study, and 40% had left the profession; whereas 43% of the subjects having patterns S, PS2 or B had obtained tenure, and only 8% had left the profession. In addition, it can be seen in Table 2-V that the subjects having pattern S were the only ones of whom a majority, albeit a small one, had obtained tenure. The relative distributions of patterns in groups TC and NTN exhibited a trend similar to that seen in groups T and NT1, but with the smaller number of cases involved, the tendency was not statistically significant.

Table 2-V

FREQUENCIES OF AUTONOMIC PATTERNS WITHIN TEACHING STATUS CATEGORIES

	T	NT1	NT2	NR	TC	NTN
P	2	10	3	4	2	4
PS1	1	7	3	4	0	1
M	15	20	11	7	6	2
S	11	10	6	2	4	4
PS2	5	7	3	0	2	2
B	0	4	3	1	0	1
Unclassified	16	19	7	7	6	4

	T	NT1	NT2	NR	TC	NTN
P + PS1	3	17	6	8	2	5
S + PS2 + B	16	21	12	3	6	7
Chi-square		4.79*	.72	7.43*		

* indicates that Chi-square for the comparison of the pattern distribution with the distribution in group T is significant at the .05 level.

T = tenured teachers.
NT1= non-tenured teachers.
NT2= non-tenured teachers who had taught for less than 3 years.
NR = teachers who had left the profession and did not intend to return.
TC = tenured teachers with children.
NTN= non-tenured teachers without children.

The means of the reactions to cold pressor stimulation for the groups are presented in Table 2-W. The only statistically significant differences were those between groups TC and NTN in the three skin temperature measures and in finger pulse volume. The mean axillary temperature response for group TC appears in the table as smaller, in terms of standard scores, than the mean for group NTN, because the measures were standardized with reference to the mean for the total sample, which was an increase in temperature. Actually, the mean axillary temperature reaction for group TC was a decrease, slightly greater in magnitude than the increase for group NTN. It can be said, therefore, that group TC showed a pattern of greater peripheral vascular reaction than group NTN. In addition, the means for group TC in six of the other seven variables were higher than those for group NTN. While these differences individually were not statistically significant, the overall pattern suggests that group TC was, in a general sense, more reactive than group NTN. A similar trend is not apparent, however, in the relatively small differences between the larger groups.

The means of the muscle tension ratings, as shown in Table 2-X consistently were lower for the tenured teachers than for the non-tenured teachers. Although only the difference between the outside observers' ratings for groups T and NT2 was statistically significant, it is noteworthy that all of the differences between the ratings for the larger tenured and non-tenured groups conformed to this one in direction. There are several

Table 2-W

STANDARDIZED MEANS OF REACTIONS TO COLD PRESSOR STIMULATION FOR SUBJECTS CLASSIFIED ACCORDING TO TEACHING STATUS

	T	NT1	NT2	NR	TC	NTN
Ns for groups:	48	76	36	25	18	18
Systolic b. p.	52.1	49.1	50.5	49.3	54.2	50.9
Diastolic b. p.	50.7	50.3	51.0	52.0	54.4	50.6
Pulse pressure*	49.2	50.7	49.5	51.5	52.1	50.2
Heart rate	51.4	48.7	48.7	48.8	52.5	48.2
Respiration rate	50.1	48.7	49.5	49.4	51.1	49.4
Palmar cond.	50.5	50.5	50.5	52.1	54.3	50.0
Finger temp.*	51.8	48.8	50.2	49.8	54.8	46.1
Face temp.	49.9	49.7	50.4	50.0	55.8	49.8
Axillary temp.	48.4	51.9	49.0	49.9	44.6	51.9
Fing. pulse vol.*	50.9	47.7	46.6	49.3	53.4	46.7
Stomach period*	48.1	49.9	47.5	49.6	46.6	52.3

Underlined means differ significantly from the means of group TC at the .05 level.
* indicates reflection of variable.

T = tenured teachers.
NT1= non-tenured teachers.
NT2= non-tenured teachers who had taught for less than 3 years.
NR = teachers who had left the profession and did not intend to return.
TC = tenured teachers with children.
NTN= non-tenured teachers without children.

Table 2-X

STANDARDIZED MEANS OF MUSCLE TENSION RATINGS AND GUILFORD-ZIMMERMAN SCORES FOR SUBJECTS CLASSIFIED ACCORDING TO TEACHING STATUS

	T	NT1	NT2	NR	TC	NTN
Ns for groups:	44	60	32	21	19	15
Muscle ten. (S)	49.9	50.2	52.0	51.1	51.2	49.2
Muscle ten. (O)	47.4	50.7	<u>52.6</u>	49.4	46.8	47.6
Muscle ten. (M)	47.1	50.5	51.6	50.8	47.5	49.7

	T	NT1	NT2	NR	TC	NTN
Ns for groups:	46	65	32	21	18	13
G.-Z. scale G	51.5	49.3	49.4	46.9	51.9	<u>44.4</u>
G.-Z. scale R	49.9	49.3	48.0	50.7	52.2	50.7
G.-Z. scale A	51.4	49.7	48.0	47.3	51.5	51.1
G.-Z. scale S	52.0	48.9	<u>46.5</u>	48.3	53.0	48.4
G.-Z. scale E	52.6	47.5	<u>46.3</u>	46.1	56.1	<u>41.8</u>
G.-Z. scale O	51.7	50.4	50.6	47.3	52.6	46.9
G.-Z. scale F	52.1	49.1	50.9	49.3	53.1	<u>40.9</u>
G.-Z. scale T	48.3	51.6	51.9	51.8	47.6	52.4
G.-Z. scale P	50.9	50.6	50.5	50.1	49.0	48.3
G.-Z. scale M	51.0	49.6	49.7	48.8	50.3	50.6
G.-Z. quest.	48.3	50.3	51.8	50.9	48.0	50.3

Underlined NT2 means differ significantly from the means of group T at the .05 level.
Underlined NTN means differ significantly from the means of group TC at the .05 level.

T = tenured teachers.
NT1= non-tenured teachers.
NT2= non-tenured teachers who had taught for less than 3 years.
NR = teachers who had left the profession and did not intend to return.
TC = tenured teachers with children.
NTN= non-tenured teachers without children.

indications in Table 2-X of personality differences between more and less successful teachers. The greatest differentiation was between groups TC and NTN, the former being particularly high in emotional stability (D) and the latter being very low in emotional stability, friendliness (F) and general activity (G). While similar trends were present in the differences between the larger groups, the only statistically significant differences were those between groups T and NT2 in emotional stability and sociability (S).

5. Relations of Teaching Status to Previous Evaluations of Teaching Performance

The relations of teaching status to the criteria of teaching performance employed in the original study and in the first-year follow-up study are shown in Tables 2-Y and 2-Z. It is apparent in Table 2-Y that the ratings of student teaching performance afford relatively little basis for prediction of subsequent success in the profession. The only set of ratings which showed any significant relation to teaching status was that by the outside observer. The University ratings and the supervisors' ratings were not even consistently higher for the tenured teachers than for the non-tenured teachers. The CTRS ratings made at the end of the first year of in-service teaching, on the other hand, are more closely related to subsequent teaching status. The results shown in Table 2-Z indicate that those in groups CB and TP were less likely to achieve tenure than those with wholly favorable ratings on the CTRS, and were more likely to spend

Table 2-Y

STANDARDIZED MEANS OF STUDENT TEACHING PERFORMANCE RATINGS FOR SUBJECTS CLASSIFIED ACCORDING TO TEACHING STATUS

	T	NT1	NT2	NR	TC	NTN
Ns for groups:	45	68	34	21	20	14
Teacher beh. (S)	50.6	50.9	50.3	49.4	49.6	51.9
Teacher beh. (O)	53.2	50.0	48.5	51.8	54.0	52.0
Teacher beh. (M)	51.8	51.0	49.8	50.7	51.5	52.0
Pupil beh. (S)	49.7	52.5	51.4	51.1	50.1	54.0
Pupil beh. (O)	52.4	50.1	49.4	52.8	54.6	51.2
Pupil beh. (M)	50.7	52.2	51.0	52.2	51.7	52.8
Total rating (S)	50.3	51.3	50.5	49.8	49.6	52.2
Total rating (O)	53.1	50.0	48.6	51.9	54.4	51.6
Total rating (M)	51.5	51.3	50.0	51.0	51.7	51.9
University rating	49.0	51.1	50.7	50.3	49.2	50.8

Underlined means differ significantly from the means of group T at the .05 level.

T = tenured teachers.
NT1= non-tenured teachers.
NT2= non-tenured teachers who had taught for less than 3 years.
NR = teachers who had left the profession and did not intend to return.
TC = tenured teachers with children.
NTN= non-tenured teachers without children.

Table 2-Z

FREQUENCIES OF FAVORABLE AND UNFAVORABLE RATINGS ON THE CONFIDENTIAL TEACHER RATING SCALE (CTRS) FOR SUBJECTS CLASSIFIED ACCORDING TO TEACHING STATUS

	T	NT1	NT2	NR	TC	NTN
F	31	31	8	7	13	8
UF	18	24	15	11	7	5
Chi-square		.51	5.12*	3.19		.04
CB	6	11	6	5	2	3
Chi-square		1.16	5.28*	4.73*		.79
TP	5	11	7	6	2	3
Chi-square		1.80	6.32*	5.71*		.79

* indicates that Chi-square is significant at the .05 level for the distribution of favorable and unfavorable ratings within the group compared with the distribution within the tenured group.

T = tenured teachers
NT1= non-tenured teachers
NT2= non-tenured teachers who had taught for less than 3 years
NR = teachers who had left the profession and did not intend to return
TC = tenured teachers with children
NTN= non-tenured teachers with children
F = rated favorably on all items of CTRS
UF = rated unfavorably on one or more items of CTRS
CB = rated unfavorably on two or more items of CTRS, Classroom Behavior Sub-section
TP = rated unfavorably on one or more items of CTRS, Teacher-parent Relations Sub-section

relatively little time in teaching or to leave the profession altogether.

6. Discussion and Conclusions

The relations found in this study between psychosomatic disorders and autonomic factor scores and patterns are consistent with the findings in numerous studies of autonomic balance in males (cf. Wenger, 1966) that tendencies toward relative sympathetic nervous system (SNS) dominance are associated with various kinds of disorders, both psychological and psychosomatic. It is rather generally believed that SNS activity is particularly prominent in states of anxiety and fear, and low autonomic factor scores for males in anxiety states have been found in several studies (Holt, 1956; Parker, 1955; Smith and Wenger, 1965; Wenger, 1948). In the present study, the lowest mean autonomic factor score was that of the anxiety group. It has been proposed (Wenger, Jones and Jones, 1956) that the anxiety-fear "axis" is characterized by a pure pattern of sympathetic dominance. The distribution of patterns within group AX in Table 2-R partly supports this idea. Not only was pattern S the modal pattern for this group but also the percentage of subjects within the group having pattern S (36%) was higher than that of any other group shown in the table. A similar finding of maximal incidence of pattern S and minimal incidence of pattern P in male subjects troubled by anxiety has been reported by Wenger (1966). However, while none of the subjects in

group AX showed patterns of parasympathetic dominance, there was a relatively high incidence of the mixed pattern PS2, in which only two variables deviate in the direction of sympathetic dominance.

Higher incidences of sympathetic patterns and lower incidences of parasympathetic patterns, along with lower autonomic factor scores, also have been found by Wenger et al. (1962) in male patients hospitalized for dermatological and gastrointestinal disorders, as compared to the normative sample of Air Force cadets whose pattern distribution is shown in Table 2-K. A major difference between the present study and previous ones is the very low incidence of pattern B in the present sample and the lack of evidence for its association with psychosomatic disorders. In the study by Wenger et al., this pattern was the modal one for both ulcerative and nonulcerative gastrointestinal disorders and for dermatological disorders other than neurodermatitis. Pattern B also has been found to occur with relatively high frequencies in male subjects with anxiety and several other disorders (Wenger, 1966).

It was thought that patterns of PNS dominance might be found with relatively higher frequencies in respiratory disorders and in headaches than in the other major categories of disorders. The increased secretion from the nasal mucosa and other symptoms found in hay fever and similar disorders are believed to be indicative of heightened PNS activity (Millonig et al., 1950), and in Wenger's (1966) study of

males the percentage of subjects having pattern P was greatest among those with hypotension and next greatest among those having migraine headaches. The autonomic factor scores and pattern distributions for groups HD and RP in the present study, however, do not offer any support to the hypothesis that these disorders are characterized by dominance of the PNS. Although the percentage of subjects having pattern S was lowest in group RP (14%) and comparable to the percentage in group ND (13%), it is evident in Table 2-R that there was no inversely corresponding tendency for the percentage of subjects having pattern P to be higher in group RP than in the other groups. Pattern PS2, on the other hand, appears to be strongly associated with respiratory disorders. Eight of the twelve subjects having this mixed pattern of PNS dominance in some functions and SNS dominance in others reported having suffered from hay fever and/or sinus trouble. Three of the four subjects in group AX who had this pattern, moreover, also had hay fever, while three of the four subjects in group RP who had pattern S also had gastrointenstinal disorders. It may be that pattern PS2 is associated mainly with respiratory disorders, whereas pattern S is associated in a less specific way with various disorders other than respiratory ones.

While there appears to be a general tendency for psychosomatic disorders to be associated with a relative dominance of SNS activity under conditions of rest, no indication was found in the present study that this condition of autonomic

imbalance was accompanied by an increased reactivity of the SNS to stimulation. On the contrary, the two significant differences in reactivity between group ND and the disorder groups (Table 2-S) both show the subjects with disorders to be less reactive than those having no disorders. Neither difference, however, can be interpreted as indicative of an inhibitory effect due to greater PNS reactivity, since each involves a physiological function whose innervation is solely sympathetic.

In the previously mentioned study of males by Wenger et al. (1962) patients with non-ulcerative gastrointestinal disorders and patients with neurodermatitis showed significantly greater heart rate reactions and significantly lesser diastolic blood pressure reactions to cold pressor that did a normal group. Eyster et al., (1952), on the other hand, reported just the opposite pattern of reaction, diminished cardiac reactivity and increased blood pressure reactivity, in a group of 10 males and fourteen female patients with atopic dermatitis. In the present study the differences between group ND and groups SK and GI in blood pressure and heart rate reactions were quite small and statistically insignificant, and thus they fail to provide confirmation for either of these previous studies. The difference between groups ND and SK in palmar conductive reactivity, however, is consistent with the finding by Wenger et al., (1962) of a similar but statistically insignificant difference between normal subjects and dermotological patients. Why subjects with skin

disorders should be less rather than more reactive in palmar conductance is a difficult question to answer. One possibility is that some of the disorders in this category might involve changes in the skin which would interfere with the response of an epidermal membrance that is thought by some investigators (Edelberg, 1964; Wilcott, 1967) to be an important factor in the palmar conductance reaction. The difference between groups ND and MN in finger pulse volume reactivity also is one whose physiological significance is not readily apparent.

Analysis of the relations between the Guilford-Zimmerman scores and the major categories of disorders provided no evidence that any particular pattern of traits characterizes subjects having any of these kinds of disorders. The fact that the anxiety group had the lowest mean score on the Emotional Stability scale (E), however, is of interest even though their mean was not significantly lower than the mean for group ND. It tends to confirm the impression that this group was the most deviant of the six disorder groups, having the lowest autonomic factor scores, the highest proportion of subjects with pattern S, the highest degree of muscle tension, and the lowest degree of emotional stability.

Evidence that autonomic nervous system functioning bears some relation to success in the teaching profession was provided by the differences found between tenured and non-tenured teachers in autonomic factor scores and in multivariate autonomic patterns. The results shown in Table 2-V suggest that there is a rather pronounced tendency for teachers who show

autonomic imbalance in the direction of relative PNS dominance to be the ones who adjust least well to teaching. Very few of those having patterns P or PS1 had obtained tenure at the time of this study, and a high proportion had left the profession. There is also some indication in Table 2-V of a converse tendency, but a less clear one, for teachers who show imbalance in the direction of relative SNS dominance, or who show certain specific mixed patterns of ANS activity, to make the best adjustment to teaching. At least the number who had left the profession was very low among those having patterns S, PS2 or B, although the proportion who had obtained tenure was about the same as among those having mean (M) or unclassified patterns.

The results shown in Table 2-X provide further confirmation for the conclusions of the initial study that muscle tension is negatively related and sociability is positively related to teaching performance. The evidence of an association between lower muscle tension and professional success, in terms of tenure, is consistent with the previous findings of negative correlations between muscle tension ratings and ratings of student teaching performance (Table 1-R) and of an association between higher muscle tension ratings and unfavorable ratings on the CTRS (Table 2-O). The differences between tenured and non-tenured teachers on the Guilford-Zimmerman Sociability scale likewise are in agreement with the positive relations between sociability and teaching performance shown in Tables 1-R and 2-O.

The other significant differences between groups in Table 2-X suggest a description of the more successful teachers as friendly, active, and emotionally stable as well as sociable. Such a constellation of traits is one that well might be expected as characteristic of better teachers. In addition, the slight tendencies for the tenured teachers to be higher in objectivity (O) and lower in thoughtfulness (T), although not statistically significant, are of interest because they contribute to an overall pattern of traits which appears to be just the inverse of one reported by Wenger (1948) to be associated with parasympathetic predominance in males. In Wenger's study, autonomic factor scores were found to be positively correlated with factors representing introversion, depression, and emotional instability, and negatively correlated with factors representing objectivity, agreeableness, cooperation and lack of nervous tenseness. This pattern of associations corresponds very closely with the pattern of tendencies shown by each of the non-tenured groups in Table 2-X: lower sociability, friendliness, objectivity and emotional stability, and higher thoughtfulness and muscle tension. Thus it can be seen that the personality and muscle tension differences between the groups are consistent with the evidence in Table 2-U and 2-V that PNS dominance tends to be associated with a lesser degree of success in the profession. The difference between the tenured and non-tenured groups in general activity also can be considered as consistent with the difference in ANS function in view of the characterization by Eppinger and Hess

(1915) of the sympathicotonic individual as more lively and excitable than the vagotonic (parasympathicotonic) individual, who sometimes is described as phlegmatic or even lethargic (Gillilan, 1954).

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APPENDIX A

INDIVIDUAL SUBJECT DATA-RECORDING FORM

NAME _____ No. _____ DATE _____ EXPERIMENT _____

Time of Measurement _____ Room Temperature _____ RS SS Wt.

SO milliliters (cc.) output for 3 minute sample . . . . . ____ ____ .14

ST _____degrees fahrenheit plus____correction (TableVI) . ____ ____ * .30

PC Sample at end of 1st and 2nd minutes, standing

1.____ 2.____ volts

1.____ 2.____ micromhos conductance. Average. . . . . ____ ____ * .09

VC Samples at 3 minute intervals, reclining

1.____ 2.____ 3.____ 4.____ K ohms resistance

Lowest conductance____micromhos plus____correction (Table V) ____ ____ * .09

LCC Samples of reclining PC at 3 minute intervals

1.____ 2.____ 3.____ 4.____ K ohms resistance

Strain_____ volts =_____ log micromhos conductance

minus lowest resting conductance____ log micromhos . . ____ ____ .17

DBP Samples at 3 minute intervals, reclining

Systolic: 1.____ 2.____ 3.____ 4.____ mm. Hg.

Diastolic: 1.____ 2.____ 3.____ 4.____ mm. Hg.

Average of the 2 DBPs accompanying 2 lowest SBPs . . . ____ ____ * .18

APPENDIX A
(Continued)

HP Samples at 3 minute intervals, reclining

1.____ 2.____ 3.____ 4.____ cycles per min.

1.____ 2.____ 3.____ 4.____ millimin./10 cycles Av. . . . . ____ ____ .41

Milliminutes per 10 cycles = 10,000/cycles min. A score _____

SBP Average of 2 lowest SBPs____plus____correction (Table VI) ____ ____ *

PP RS entry for SBP minus IS entry for DBP . . . . . ____ ____

First FiT ____ C. +____ C. correction (Table VI) . . . . . ____ ____

Second FiT ____ C. +____ C. correction (Table VI) . . . . . ____ ____

DL seconds . . . . . ____ ____ *

DP minutes . . . . . ____ ____

PD average of two consistent measurements . . . . . ____ ____ *

RP Samples at 3 minute intervals, reclining

1.____ 2.____ 3.____ 4.____ seconds per cycle Av. . . . . ____ ____

* Asterisk indicates reflected standard score.

KEY FOR INDIVIDUAL SUBJECT DATA-RECORDING FORM

SO .....Salivary Output

ST .....Sublingual Temperature

PC .....Palmar Conductance

VC .....Volar Conductance

LC .....Log Conductance

DBP .....Diastolic Blood Pressure

HP .....Heart Period

SBP .....Systolic Blood Pressure

PP .....Pulse Pressure

First FiT .....First Finger Temperature

Second FiT .....Second Finger Temperature

DL .....Dermographia Latency

DP .....Dermographia Persistence

PD .....Pupillary Diameter

RP .....Respiration Period

RS .....Raw Score

SS .....Standard Score

* .....Reflection of Standard Score

Wt. .....Beta Weight for estimation of male autonomic factor

Corrections are given in Tables V and VI of M.A. Wenger, "Studies of autonomic balance in Army Air Force personnel." Comparative Psychology Monographs (University of California Press), 1948, Vol. 19, No. 4

APPENDIX B

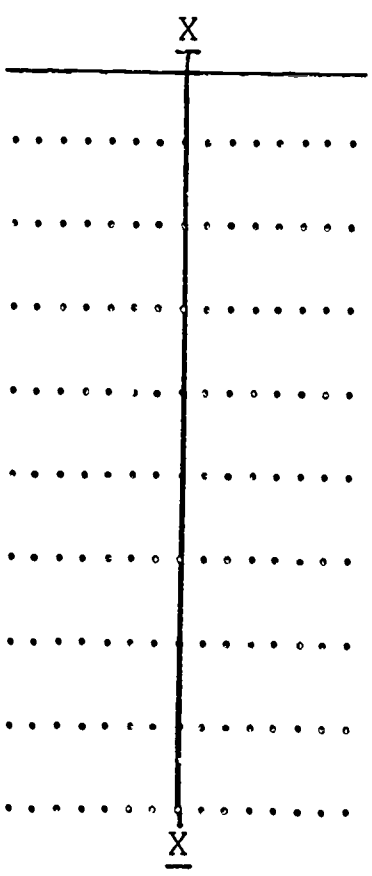
SCALE FOR RATING CHARACTERISTIC LEVEL OF MUSCULAR TENSION

INSTRUCTION TO RATER: Wait until you have observed the subject for two weeks before you attempt to rate him. Do not discuss this scale with the subject.

Try to picture the subject in non-emotional situations, and exclude the factor of restlessness as much as possible. If he is relaxed, he appears to move freely; his arms and hands give the impression of just "hanging"; his face is rather blank and immobile. If he is tense, his movements are more jerky, more "massive" in the sense of a "tight" body reacting as an uncoordinated whole, or set ready to react at the slightest provocation. His face is not impassive. It and his whole body give an impression of strain.

Characteristic tension of the skeletal muscles is a variable which may be separated from emotional behavior and from restlessness. Although emotion includes muscular tension, tension may be present in the absence of emotion. Although restlessness is based on a certain amount of residual tension, the extremely tense individual may inhibit restlessness while the relatively relaxed person may be freer to show some restlessness.

TO MAKE YOUR RATING, PLACE A CHECK MARK AT THE MOST APPROPRIATE POINT ON THE X LINE BELOW, BUT DO NOT PLACE YOUR MARK AT THE DOTTED LINES. PLACE IT SOMEWHERE BETWEEN THE DOTTED LINES. IF YOU CANNOT BE SURE OF YOUR RATING, GUESS. DON'T RATE HIM AS AVERAGE UNLESS YOU BELIEVE HE IS TRULY AVERAGE.



___Tense. Seems never to relax and take things easy. Looks and acts as though under constant muscular strain.

___Usually tense. Movements are often jerky, uneven.

___Just average. Cannot be described as either tense or relaxed.

___Relaxed, but not sleepy. Movements easy and "loose"; rather limp.

___So relaxed he looks and acts almost asleep.

Name of Subject _____ Class _____

Name of Rater _____ School _____ Date _____

APPENDIX C

CLASSROOM OBSERVATION RECORD

Teacher_____ Class or Subject_____ Date_____

City_____ School_____ Time_____ Observer_____

PUPIL BEHAVIOR	(Circle one only)	REMARKS:
1. Apathetic	1 2 3 4 5 6 7 N	Alert
2. Obstructive	1 2 3 4 5 6 7 N	Responsible
3. Uncertain	1 2 3 4 5 6 7 N	Confident
4. Dependent	1 2 3 4 5 6 7 N	Initiating
TEACHER BEHAVIOR	**(Circle one only)**	
5. Partial	1 2 3 4 5 6 7 N	Fair
6. Autocratic	1 2 3 4 5 6 7 N	Democratic
7. Aloof	1 2 3 4 5 6 7 N	Responsive
8. Restricted	1 2 3 4 5 6 7 N	Understanding
9. Harsh	1 2 3 4 5 6 7 N	Kindly
10. Dull	1 2 3 4 5 6 7 N	Stimulating
11. Stereotyped	1 2 3 4 5 6 7 N	Original
12. Apathetic	1 2 3 4 5 6 7 N	Alert
13. Unimpressive	1 2 3 4 5 6 7 N	Attractive
14. Evading	1 2 3 4 5 6 7 N	Responsible
15. Erratic	1 2 3 4 5 6 7 N	Steady
16. Excitable	1 2 3 4 5 6 7 N	Poised
17. Uncertain	1 2 3 4 5 6 7 N	Confident
18. Disorganized	1 2 3 4 5 6 7 N	Systematic
19. Inflexible	1 2 3 4 5 6 7 N	Adaptable
20. Pessimistic	1 2 3 4 5 6 7 N	Optimistic
21. Immature	1 2 3 4 5 6 7 N	Integrated
22. Narrow	1 2 3 4 5 6 7 N	Broad

N means not observed

APPENDIX D

GLOSSARY

(To be used with Classroom Observation Record)

Pupil Behaviors

1. Apathetic-Alert Pupil Behavior

Apathetic

1. Listless.
2. Bored-acting.
3. Enter into activities half-heartedly.
4. Restless.
5. Attention wanders.
6. Slow in getting underway.

Alert

1. Appear anxious to recite and participate.
2. Watch teacher attentively.
3. Work concentratedly.
4. Seem to respond eagerly.
5. Prompt and ready to take part in activities when they begin.

2. Obstructive-Responsible Pupil Behavior

Obstructive

1. Rude to one another and/or teacher.
2. Interrupting; demanding. attention; disturbing.
3. Obstinate; sullen.
4. Refusal to participate.
5. Quarrelsome; irritable.
6. Engaged in name-calling and/or tattling.
7. Unprepared.

Responsible

1. Courteous, cooperative, friendly with each other and with teacher.
2. Complete assignments without complaining or unhappiness.
3. Controlled voices.
4. Received help and criticism attentively.
5. Asked for help when needed.
6. Orderly without specific directions from teacher.
7. Prepared.

3. Uncertain-Confident Pupil Behavior

Uncertain

1. Seem afraid to try; unsure.
2. Hesitant; restrained.
3. Appear embarrassed.
4. Frequent display of nervous habits, nail-biting, etc.
5. Appear shy and timid.
6. Hesitant and/or stammering speech.

Confident

1. Seem anxious to try new problems or activities.
2. Undisturbed by mistakes.
3. Volunteer to recite.
4. Enter freely into activities.
5. Appear relaxed.
6. Speak with assurance.

Pupil Behaviors (Continued)

4. Dependent-Initiating Pupil Behavior

Dependent	Initiating
1. Rely on teacher for explicit directions.	1. Volunteer ideas and suggestions.
2. Show little ability to work things out for selves.	2. Showed resourcefulness.
3. Unable to proceed when initiative called for.	3. Take lead willingly.
4. Appear reluctant to take lead or to accept responsibility.	4. Assume responsibilities without evasion.

Teacher Behaviors

5. Partial-Fair Teacher Behavior

Partial	Fair
1. Repeatedly slighted a pupil.	1. Treated all pupils approximately equally.
2. Corrected or criticized certain pupils repeatedly.	2. In case of controversy pupil allowed to explain his side.
3. Repeatedly gave a pupil special advantages.	3. Distributed attention to many pupils.
4. Gave most attention to one or a few pupils.	4. Rotated leadership impartially.
5. Showed prejudice (favorable or unfavorable) towards some social, racial, or religious groups.	5. Based criticism or praise on factual evidence, not hearsay.
6. Expressed suspicion of motives of a pupil.	

6. Autocratic-Democratic Teacher Behavior

Autocratic	Democratic
1. Tells pupils each step to take.	1. Guided pupils without being mandatory.
2. Intolerant of pupils' ideas.	2. Exchanged ideas with pupils.
3. Mandatory in giving directions; orders to be obeyed at once.	3. Encouraged (asked for) pupil opinion.
4. Interrupted pupils although their discussions was relevant.	4. Encouraged pupils to make own decisions.
5. Always directed rather than participated.	5. Entered into activities without domination.

Teacher Behaviors
(Continued)

7. Aloof-Responsive Teacher Behavior

Aloof	Responsive
1. Stiff and formal in relations with pupils.	1. Approachable to all pupils.
2. Apart; removed from class activity.	2. Participates in class activity.
3. Condescending to pupils.	3. Responded to reasonable requests and/or questions.
4. Routine and subject-matter only concern; pupils as persons ignored.	4. Speaks to pupils as equals.
5. Referred to pupils as "this child" or "that child."	5. Commends effort.
	6. Gives encouragement.
	7. Recognized individual differences.

8. Restricted-Understanding Teacher Behavior

Restricted	Understanding
1. Recognized only academic accomplishments of pupils; no concern for personal problems.	1. Showed awareness of a pupil's personal emotional problems and needs.
2. Completely unsympathetic with a pupil's failure at a task.	2. Was tolerant of error on part of pupil.
3. Called attention only to very good or very poor work.	3. Patient with a pupil beyond ordinary limits of patience.
4. Was impatient with a pupil.	4. Showed what appeared to be sincere sympathy with a pupil's viewpoint.

9. Harsh-Kindly Teacher Beahvior

Harsh	Kindly
1. Hypercritical; fault-finding.	1. Goes out of way to be pleasand and/or to help pupils; friendly.
2. Cross; curt.	2. Gave a pupil a deserved compliment.
3. Depreciated pupil's efforts; was sarcastic.	3. Found good things in pupils to call attention to.
4. Scolds a great deal.	4. Seemed to show sincere concern for a pupil's personal problem.
5. Lost temper.	5. Showed affection without being demonstrative.
6. Used threats.	6. Disengaged self from a pupil without bluntness.
7. Permitted pupils to laugh at	

Teacher Behaviors
(Continued)

10. Dull-Stimulating Teacher Behavior

Dull	Stimulating
1. Uninteresting, monotonous explanations.	1. Highly interesting presentation; gets and holds attention without being flashy.
2. Assignments provide little or no motivation.	2. Clever and witty, though not smart-alecky or wise-cracking.
3. Fails to provide challenge.	3. Enthusiastic; animated.
4. Lack of animation.	4. Assignments challenging.
5. Failed to capitalize on pupil interests.	5. Took advantage of pupil interests.
6. Pedantic, boring.	6. Brought lesson successfully to a climax.
7. Lacks enthusiasm; bred acting.	7. Seemed to provoke thinking.

11. Stereotyped-Original Teacher Behavior

Stereotyped	Original
1. Used routine procedures without variation.	1. Used what seemed to be original and relatively unique devices to aid instruction.
2. Would not depart from procedure to take advantage of a relevant question or situation.	2. Tried new materials or methods.
3. Presentation seemed unimaginative.	3. Seemed imaginative and able to develop presentation around a question or situation.
4. Not resourceful in answering questions or providing explanations.	4. Resourceful in answering questions; had many pertinent illustrations available.

12. Apathetic-Alert Teacher Behavior

Apathetic	Alert
1. Seemed listless; lanquid; lacked enthusiasm.	1. Appeared buoyant; wide awake; enthusiastic about activity of the moment.
2. Seemed bored by pupils.	2. Kept constructively busy.
3. Passive in response to pupils.	3. Gave attention to, and seemed interested in, what was going on in class.
4. Seemed preoccupied.	4. Prompt to "pick up" class when pupils' attention showed signs of lagging.
5. Attention seemed to wander.	
6. Sat in chair most of time; took no active part in class activities.	

Teacher Behaviors
(Continued)

13. Unimpressive-Attractive Teacher Behavior

Unimpressive	Attractive
1. Untidy or sloppily dressed.	1. Clean and Neat.
2. Inappropriately dressed.	2. Well-groomed; dress showed good taste.
3. Darb, colorless.	3. Posture and bearing attractive.
4. Posture and bearing unattractive.	4. Free from distracting personal habits.
5. Possessed distracting personal habits.	5. Plainly audible speech; good expression; agreeable voice tone; good inflection.
6. Mumbled; inaudible speech; limited expression disagreeable voice tone; poor inflection.	

14. Evading-Responsible Teacher Behavior

Evading	Responsible
1. Avoided responsibility; disinclined to make decisions.	1. Assumes responsibility; makes decisions as required.
2. "Passed the buck" to class, to other teachers, etc.	2. Conscientious.
3. Left learning to pupil, failing to give adequate help.	3. Punctual.
4. Let a difficult situation get out of control.	4. Painstaking; careful.
5. Assignments and directions indefinite.	5. Suggested aids to learning.
6. No insistance on either individual or group standards.	6. Controlled a difficult situation.
7. Inattentive with pupils.	7. Gave definite directions.
8. Cursory.	8. Called attention to standards of quality.
	9. Attentive to class.
	10. Thorough.

15. Erratic-Steady Teacher Behavior

Erratic	Steady
1. Impulsive; uncontrolled; temperamental; unsteady.	1. Calm; controlled.
2. Course of action easily swayed by circumstances of the moment.	2. Maintained progress toward objective.
3. Inconsistent.	3. Stable, consistent, predictable.

Teacher Behaviors
(Continued)

16. Excitable-Poised Teacher Behavior

Excitable	Poised
1. Easily disturbed and upset; flustered by classroom situation.	1. Seemed at ease at all times.
2. Hurried in class activities; spoke rapidly using many words and gestures.	2. Unruffled by situation that developed in classroom; dignified without being stiff or formal.
3. Was "jumpy"; nervous.	3. Unhurried in class activities; spoke quietly and slowly.
	4. Successfully diverted attention from a stress situation in classroom.

17. Uncertain-Confident Teacher Behavior

Uncertain	Confident
1. Seemed unsure of self; faltering, hesitant.	1. Seemed sure of self; self-confident in relations with pupils.
2. Appeared timid and shy.	2. Undisturbed and unembarrassed by mistakes and/or criticism.
3. Appeared artificial.	
4. Disturbed and embarrassed by mistakes and/or criticism.	

18. Disorganized-Systematic Teacher Behavior

Disorganized	Systematic
1. No plan for class-work.	1. Evidence of a planned though flexible procedure.
2. Unprepared.	2. Well prepared.
3. Objectives not apparent; undecided as to next step.	3. Careful in planning with pupils.
4. Wasted time.	4. Systematic about procedure of class.
5. Explanations not to the point.	5. Had anticipated needs.
6. Easily distracted from matter at hand.	6. Provided reasonable explanations.
	7. Held discussion together; objectives apparent.

Teacher Behaviors
(Continued)

19. Inflexible-Adaptable Teacher Behavior

Inflexible	Adaptable
1. Rigid in conforming to routine.	1. Flexible in adapting explanations.
2. Made no attempt to adapt materials to individual pupils.	. Individualized materials for pupil , as required; adapted activities to pupils.
3. Appeared incapable of modifying explanation or activities to meet particular classroom situations.	3. Took advantage of pupils' questions to further clarify ideas.
4. Impatient with interruptions and digressions.	4. Met an unusual classroom situation competently.

20. Pessimistic-Optimistic Teacher Behavior

Pessimistic	Optimistic
1. Depressed; unhappy.	1. Cheerful; good natured.
2. Skeptical.	2. Genial.
3. Called attention to potential "bad."	3. Joked with pupils on occasion.
4. Expressed hopelessness of "education today," the school system, or fellow educators.	4. Emphasized potential "good."
5. Noted mistakes; ignored good points.	5. Looked on bright side; spoke optimistically of the future.
6. Frowned a great deal; had unpleasant facial expression.	6. Call attention to good points; emphasized the positive.

21. Immature-Integrated Teacher Behavior

Immature	Integrated
1. Appeared naive in approach to classroom situations.	1. Maintained class as center of activity; kept self out of spotlight; referred to class's activities, not own.
2. Self-pitying; complaining; demanding.	2. Emotionally well controlled.
3. Boastful; conceited.	

Teacher Behaviors
(Continued)

22. Narrow-Broad Teacher Behavior

Narrow	Broad
1. Presentation strongly suggested limited background in subject or material; lack of scholarship.	1. Presentation suggested good background in subject; good scholarship suggested.
2. Did not depart from text.	2. Drew examples and explanations from various sources and related fields.
3. Failed to enrich discussions with illustrations from related areas.	3. Showed evidence of broad cultural background in science, art, literature, history, etc.
4. Showed little evidence of breadth of cultural background in such areas as science, art, literature and history.	4. Gave satisfying, complete, and accurate answers to questions.
5. Answers to pupils' questions incomplete or inaccurate.	5. Was constructively critical in approach to subject-matter.
6. Non-critical approach to subject.	

APPENDIX E

UNIVERSITY OF CALIFORNIA – LOS ANGELES
RATING SCALE FOR STUDENT TEACHING – ELEMENTARY SCHOOL

	F	D	C	B	A
A. PERSONAL CHARACTERISTICS					
1. PHYSICAL HEALTH AND VITALITY – (vigorous, good posture, free of illness).					
2. EMOTIONAL MATURITY					
a. poise, self-control, free from shyness and offensive aggressiveness.					
b. meets unexpected and changing situation with decision and good judgment.					
3. APPEARANCE – (neat, well-groomed, dresses appropriately and in good taste, appears refined)					
4. CHARACTER AND INTEGRITY – (good sense of values, trustworthy)					
5. PERSONALITY CHARACTERISTICS					
a. Uses courtesy and tact in all relationships.					
b. Creativity					
c. Initiative					
6. VOICE AND SPEECH (pleasant, flexible, clear, effective, adapted to purpose and situation)					
7. ACADEMIC PROFICIENCY – a. Understanding basic subject matter, b. Proficiency in verbal and written expression. a. b.					
B. PROFESSIONAL COMPETENCE					
8. CLASSROOM ARRANGEMENT – (attends to lighting, ventilation, seating, neat, attractive, functional room)					
9. MANAGEMENT OF CLASSROOM ROUTINE – (orderly, prompt, effective routines, involving pupil participation)					
10. DISCIPLINE					
a. Guides pupils to formulate and maintain desirable standards.					
b. Consistently emphasizes the positive.					
c. Builds responsible self-control.					
d. Is sympathetic and objective when dealing with undesirable behavior.					
e. Provides dynamic, inspirational leadership.					
11. PRINCIPLES OF LEARNING					
a. Emphasizes purposeful experience and intrinsic motivation.					
b. Plans and evaluates cooperatively with children.					
c. Meets each child's needs for acceptance, security, success, recognition, and valid praise.					
d. Provides effective review, practice and drill, keeping these subordinate to understanding.					
e. Promotes total group participation.					
12. CHILD DEVELOPMENT					
a. Understanding of developmental level of pupils and developmental tasks confronting them.					
b. Plans differentiated activities and standards to meet individual needs.					
c. Adapts procedures to the responses of his pupils. (Resourcefulness and flexibility)					
d. Takes into account the pressures on children from the peer culture, home, and community.					
e. Maintains positive rapport and good emotional atmosphere.					
13. PLANNING					
a. Defines worthwhile objectives for large units and daily classwork.					
b. Organizes his teaching by careful choice and sequence of experiences, content, and materials.					
c. Uses a wide variety of materials of instruction.					
14. TEACHING PROCEDURES					
a. Provides for pupil participation in purposing, planning, executing and evaluating.					
b. Makes skillful use of guiding questions.					
c. Develops pupils' study and problem-solving skills.					
d. Stimulates creative responses.					
15. USE OF DIAGNOSTIC AND REMEDIAL MEASURES. (Helps pupils find own errors and needs, and helps to meet these)					
16. ACHIEVING RESULTS					
a. Carries plans through to successful conclusion.					
b. Is able to communicate ideas to children.					
c. Is able to demonstrate vividly and effectively.					
d. Children evidence growth in school subjects and social habits.					
17. EVALUATION OF PUPIL ACHIEVEMENT – (uses formal and informal means of measuring growth)					
18. PROFESSIONAL ETHICS					
a. Works harmoniously and cooperatively with peers.					
b. Works effectively toward common goals with supervisors.					
c. Evidences professional attitudes.					
19. EVALUATION AND GROWTH					
a. Assumes responsibility for continued professional growth.					
Analyzes own strengths and weaknesses in order to effect continuous improvement.					
c. Is sensitive to pupils' reactions, needs, and difficulties as a basis for evaluating success.					
20. PROMISE OF FUTURE GROWTH AND SUCCESS.					
a. Is likely to continue personal and professional growth.					
b. Fulfills obligations.					
c. Evidences independence by latter part of the assignment.					
Total number of checks by column					
Score value	1	2	3	4	5
Score (score value of each column times number of checks)					
Average score (sum of scores divided by total checks)					

A = 4.6 – 5.0
B = 3.6 – 4.5
C = 2.5 – 3.5
D = 1.5 – 2.4
F = 1.0 – 1.4

FINAL GRADE _____

APPENDIX F

A Description of the Guilford-Zimmerman Temperament Survey Traits**

G = General Activity: Liking for speed, energy, production, efficiency vs. slow and deliberate, inefficient, easily fatigued.

R = Restraint: Serious-minded, persistent, deliberate vs. impulsive, carefree, excitement-loving.

A = Ascendence: Leadership, self-defense, persuading others, bluffing vs. submissiveness, following, hesitation.

S = Sociability: Having many friends, seeking social contacts and limelight vs. having few friends, shyness.

E = Emotional Stability: Eveness of moods, optimism, good health vs. fluctuation of moods, pessimism, guilt, loneliness, daydreaming.

O = Objectivity: Thick-skinned vs. hypersensitive, self-centered, suspicious, getting into trouble.

F = Friendliness: Toleration of hostile action, respect for others vs. belligerence, hostility, contempt for others, desire to dominate.

T = Thoughtfulness: Reflective, observing of self and others vs. interest in overt activity, mental disconcertedness.

P = Personal Relations: Tolerance of people, faith in social intitutions vs. fault-finding, suspiciousness, self-pitying.

M = Masculinity: Interest in masculine activities, hard-boiled, inhibition of emotional expression vs. interest in feminine activities, sympathetic, fearful, emotionally expressive.

**Summarized from: J. P. Guilford and Wayne S. Zimmerman, The Guilford-Zimmerman Temperament Survey: Manual of Instructions and Interpretations. Beverly Hills, California: Sheridan Supply Company, 1949. 12 pages.

APPENDIX G

SUPPLEMENTARY DATA FORMS

SMOKING QUESTIONNAIRE

1. Do you smoke? Yes _____ No _____
2. If so, approximately how many cigarettes per day? _____
3. Do you inhale? Never _____ Sometimes _____
   Usually _____ Always _____
4. Preferred brand of cigarettes? _____
5. Do you recall the time of your last cigarette before you took part in the laboratory measurements? _____

DATA ON MENSTRUAL CYCLE (Obtained by women laboratory technicians)

1. Date of onset of last menstrual period? _____
2. Date of end of last menstrual period? _____
3. Usual length of period? _____
4. Usual length of cycle? _____
5. Regular? If not, how irregular? How many days late, if ever? Are periods skipped or do you menstruate once every month?
6. Any dismenorrhea? Before? During? Or After? What kind? ("Cramps"--slight first day? Backache, headache, fatigue, and so on)
7. Eye color

PERSONAL INFORMATION (Obtained by women laboratory technicians)

1. Name: Last, First, Middle. TEST NUMBER _____
2. Address: City, Telephone. DATE AND TIME OF TEST _____
3. Date of Birth
4. Height, weight
5. Academic Level in the University (junior, senior, graduate)
6. Specific class in teacher education, section.
7. Miscellaneous: colds, infections, taking medication, recent hospitalization, and so on.

APPENDIX H

CONFIDENTIAL TEACHER RATING SCALE

Name of teacher _____

INSTRUCTIONS: For each of the 12 items listed below check only one of the two possible responses which in your judgement most nearly describes the general tendencies of this teacher. Please respond to all items and do not use question marks.

QUESTIONS:

1. In teaching pupils does this teacher tend to be.....TENSE __ or RELAXED __
2. Does this teacher have.....FAVORABLE OPINIONS OF PUPILS __ or UNFAVORABLE __
3. Is this teacher's classroom behavior.....FRIENDLY __ or UNFRIENDLY __
4. Is this teacher's classroom behavior.....SYSTEMATIC __ or UNPLANNED __
5. Is this teacher's classroom behavior.....STIMULATING __ or ROUTINE __
6. In relations with other teachers does this teacher tend to be.....TENSE __ or RELAXED __
7. Is this teacher.....LIKED BY PUPILS __ or DISLIKED __
8. Is this teacher.....LIKED BY OTHER TEACHERS __ or DISLIKED __
9. Does this teacher have FAVORABLE OPINIONS OF OTHER TEACHERS __ or UNFAVORABLE __
10. Does this teacher have.....FAVORABLE OPINIONS OF PARENTS __ or UNFAVORABLE __
11. Is this teacher.....LIKED BY PARENTS __ or DISLIKED __
12. Does this teacher tend to be.....EMOTIONALLY STABLE __ or UNSTABLE __

OTHER DATA:

A. Would you please record the number of days' absence for this teacher during the time he has taught at your school: ABSENCE DUE TO ILLNESS _____
ABSENCE DUE TO OTHER CAUSES _____

NOTE: If you do not have data on absences would you indicate the Central or District Office where we could obtain this information:
NAME OF DISTRICT OFFICE _____
ADDRESS OF OFFICE _____

B. Dates of employment of this teacher in your school:
FROM _____ TO _____
Month Year Month Year

C. If this teacher is no longer in your school or has left teaching, could you list the reason(s):

PLEASE RETURN THIS FORM IN THE ENCLOSED STAMPED ENVELOPE MARKED CONFIDENTIAL

APPENDIX H
(Continued)

CONFIDENTIAL INQUIRY - TO ADDRESSEE ONLY

Dear Administrator:

Faculty members of the Departments of Education and Psychology are engaged in a long-term investigation of factors related to teacher selection. For one essential part of this study we ask your professional assistance. Would you be kind enough to fill out the attached brief confidential inquiry form in order to provide us with supplementary information on recent graduates in teacher education?

The overall purpose of the investigation is to study a large number of variables which may be related to teacher selection. We hope that the analyses of these variables will make it possible to formulate better criteria for teacher selection and improve the program of teacher education. We have addressed this request for help to you, because our present records show that you are the responsible officer who regularly supervises the teacher named on the inquiry form. We believe you can provide the most valid judgements.

The attached inquiry form is designed to obtain normative statistical data only. The information will be incorporated with similar data from other samples, after which the inquiry forms will be destroyed. The information will not be made a part of the personal records of the teachers concerned, nor will individuals be identified in any way. In order to maintain the confidential nature of the inquiry we would like to request that you not discuss your ratings with other persons.

Your individual response is essential in helping us to obtain complete returns on as large a sample of teachers as possible; returns on only a few persons will be of little value.

Please return the form in the enclosed stamped envelope at your earliest convenience.

Thank you for your cooperation.

Sincerely yours,

W. H. Lucio
Professor of Education

Enclosure: 1

APPENDIX I

GENERAL HEALTH INVENTORY

INSTRUCTIONS: Please indicate whether you have been troubled by any of the following problems. If so, did they first occur before or after your graduation from UCLA? If they first occurred before graduation, please write "BEFORE" in the space in front of the item. If any occurred after graduation, please write "AFTER" in the space. If you have never been troubled by the disorder, please leave the space blank.

1. _____ allergies
   What kind? _____
2. _____ boils
3. _____ eczema
   Where? _____
4. _____ excessive sweating
   Where? _____
5. _____ shingles
6. _____ skin rash
   Where? _____
7. _____ frequent constipation
8. _____ frequent diarrhea
9. _____ hemmorrhoids
10. _____ stomach pains
11. _____ stomach or duodenal ulcer
    Which? _____
12. _____ diabetes
    What kind? _____
13. _____ goiter
    What kind? _____
14. _____ hormone deficiency
    What kind? _____
15. _____ hormone excess
    What kind? _____
16. _____ epilepsy
    What kind? _____
17. _____ nervous breakdown
    What kind? _____
18. _____ persistent anxiety
19. _____ persistent apprehension or fear
20. _____ persistent depression
21. _____ persistent nervousness
22. _____ dizzy spells
    What kind? _____
23. _____ heart trouble
    What kind? _____
24. _____ high blood pressure
    What kind? _____
25. _____ low blood pressure
    What kind? _____
26. _____ arthritis
27. _____ non-allergic asthma
28. _____ bronchitis
29. _____ colitis
    What kind? _____
30. _____ emphysema
31. _____ frequent colds
32. _____ frequent coughing
33. _____ frequent earaches
34. _____ frequent headaches
35. _____ migraine headaches
36. _____ hay fever
37. _____ sinus trouble
38. _____ tuberculosis
39. _____ chronic fatigue
40. _____ insomnia
41. _____ sleep walking
42. _____ marked pain during menstruation
43. _____ pre-menstrual tension

APPENDIX I
(Continued)

GENERAL HEALTH INVENTORY (Continued)

A. Please circle the number of any items in the previous Health Inventory for which you were treated by a doctor.

B. If you have had any other disorders not included in the previous Health Inventory, please list them below and indicate whether they first occurred before or after graduation.

_____

_____

_____

_____

_____

C. If you have ever been a patient in a hospital, please indicate for what reason (s) you were hospitalized and the approximate date (s).

_____

_____

_____

****

Please list below any changes, procedures, or corditions in the organization and/or administration of schools which you feel would contribute to maintaining the physical and mental health of teachers.

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX J

PROFESSIONAL STATUS INVENTORY

1. What is your marital status? Single Married Divorced Separated (Circle one)
2. No. of Children _____

3. Are you now teaching? YES NO (Circle one)

   (a) If "no," would you state your reason for leaving? _____

   _____

   (b) Do you plan to return to the profession? YES NO (Circle one)
   (c) If "yes," please estimate when? _____
   (d) Have you renewed your credential? YES NO (Circle one)

4. Please list in chronological order all the teaching positions you have held since graduation:

School Name	Grade(s) Taught	Dates	School District
a. First Position:			
_____	_____	_____	_____
_____	_____	_____	
_____	_____	_____	_____
b. Second Position:			
_____	_____	_____	_____
_____	_____	_____	
_____	_____	_____	_____
_____	_____	_____	
c. Third Position:			
_____	_____	_____	_____
_____	_____	_____	
_____	_____	_____	_____

   (Continue on reverse side if necessary)

5. Have you received tenure? _____ (a) Where? _____
   (b) When? _____

6. Continued Academic Work:

   a. Total number of graduate credits since leaving UCLA _____
   b. Area(s) of graduate study: _____

   _____

   c. Degrees received and dates: _____
   d. Honors received (scholarships, fellowships, awards, etc.): _____

   _____

   _____

7. Are you now participating in any type of career training program (e.g., an internship)? YES NO (Circle one)

   (a) Describe the program: _____

   _____

   _____

Computer file No.

APPENDIX J
(Continued)

PROFESSIONAL INQUIRY - TO UCLA GRADUATES IN TEACHER EDUCATION

Dear Alumna:

The Department of Education, University of California, Los Angeles, supported by a University research grant, is engaged in a long-term investigation of the teaching profession.

As one important phase of the study, the enclosed inquiry forms are being sent to a large number of UCLA graduates of recent years. The overall purpose of the study is to isolate a number of variables related to teachers and to the environments in which they work. Our primary concern is to examine ideas about teaching and not to assess individuals. We hope that the analyses of variables (based on responses from large numbers of former students) will contribute to improvements in the program of teacher education. Please be assured that the information you provide is for statistical and research purposes only. Your individual response is important in helping us to obtain complete returns on as large a sample of teachers as possible; returns from only a few persons will be of little value.

We would appreciate very much your completing the two enclosed forms (which should take only five minutes of your time). Please give us this time and answer the items to the best of your knowledge. File numbers on the forms are for the purpose of tabulating the distribution of returns for the various groups of graduates. Do not sign any of the forms.

Mrs. Carolyn Ellner, Graduate Research Assistant, is responsible for processing the data. Please return the forms at your earliest convenience in the enclosed stamped envelope addressed to her attention.

Thank you for your cooperation.

Sincerely yours.

W. H. Lucio
Professor of Education

Enclosures: 3